VOL. 178 No. 3 AMERICAN MARCH, 1953

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American Gas Journal

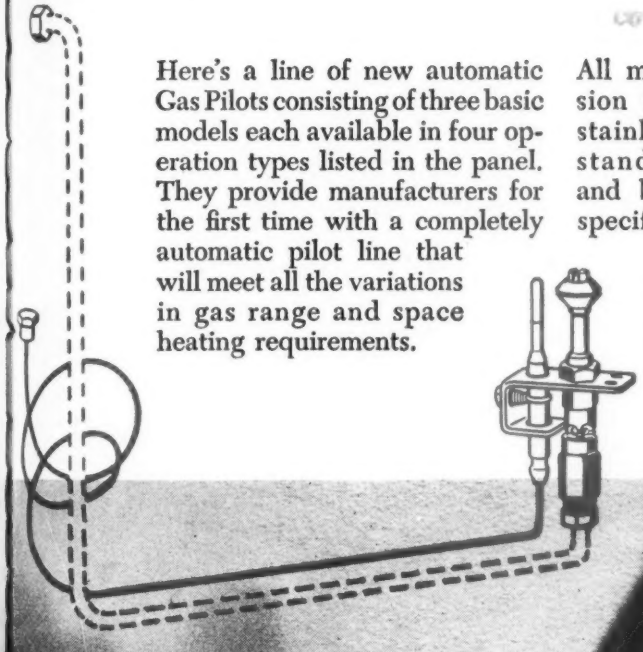
DEPENDABLE *Automatic* GAS PILOTS for RANGES and SPACE HEATERS

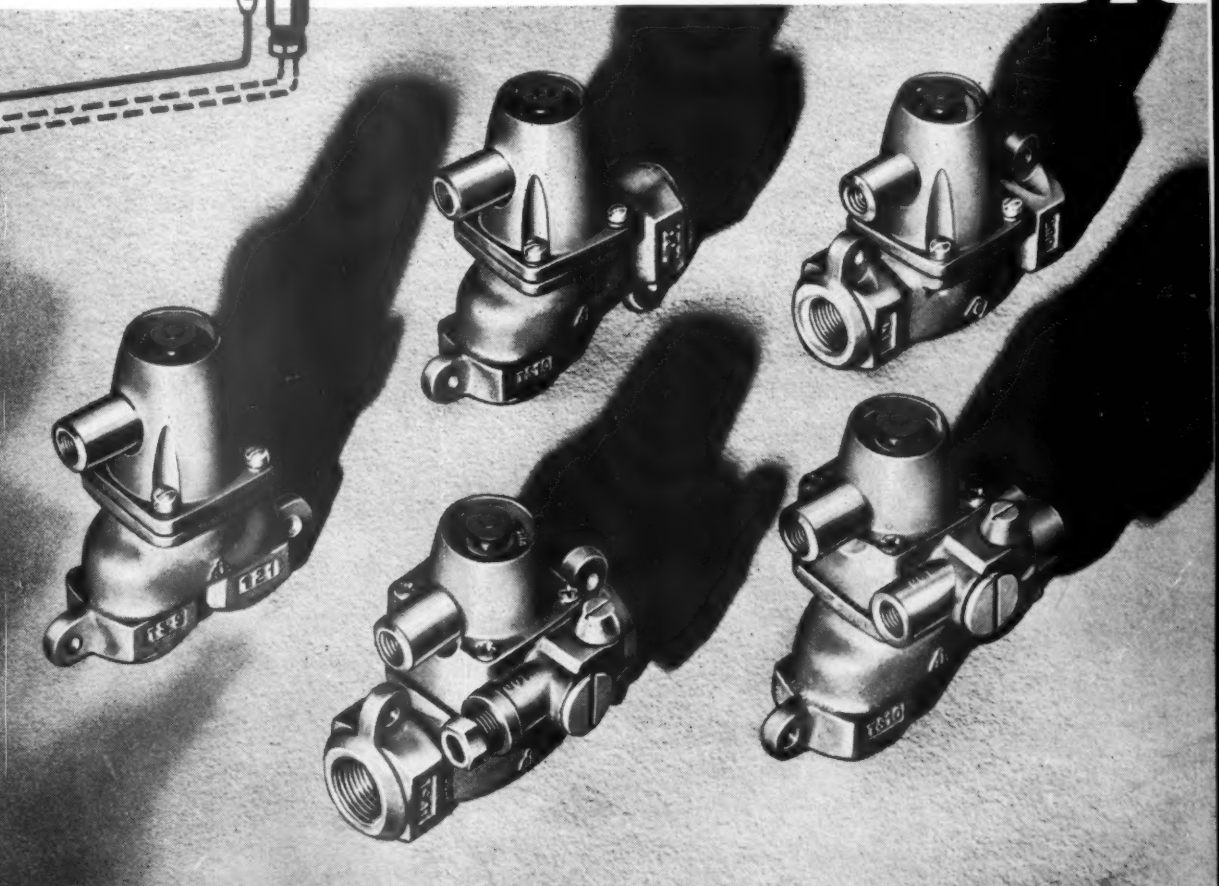
Here's a line of new automatic Gas Pilots consisting of three basic models each available in four operation types listed in the panel. They provide manufacturers for the first time with a completely automatic pilot line that will meet all the variations in gas range and space heating requirements.

All models are made of corrosion resistant aluminum and stainless steel parts to withstand the effect of sour gas and built to the rigid quality specifications standard for all Robertshaw®-Grayson products. They can be depended upon to give long, dependable service.

Write for full information.

Robertshaw-Fulton
CONTROLS COMPANY
GRAYSON CONTROLS DIVISION
Lynwood • California





MODEL NUMBERS
TS-9 "U" Shape Valve Body
TS-10 "L" Shape Valve Body
TS-11 Straight Through Gas Flow Body

ALL AVAILABLE IN FOUR OPERATION TYPES:
TYPE A — With Flow Interrupter Valve for Safe Lighting
TYPE B — With Non-Flow Interrupter Valve for Standard Lighting
TYPE C — With complete External 100% control whereby Pilot Gas Flow is completely divorced from Flow of Gas to Main Burner
TYPE D — With Pilot Gas take-off at the Control itself

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METAL FLANGED
DIAPHRAGMS

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and
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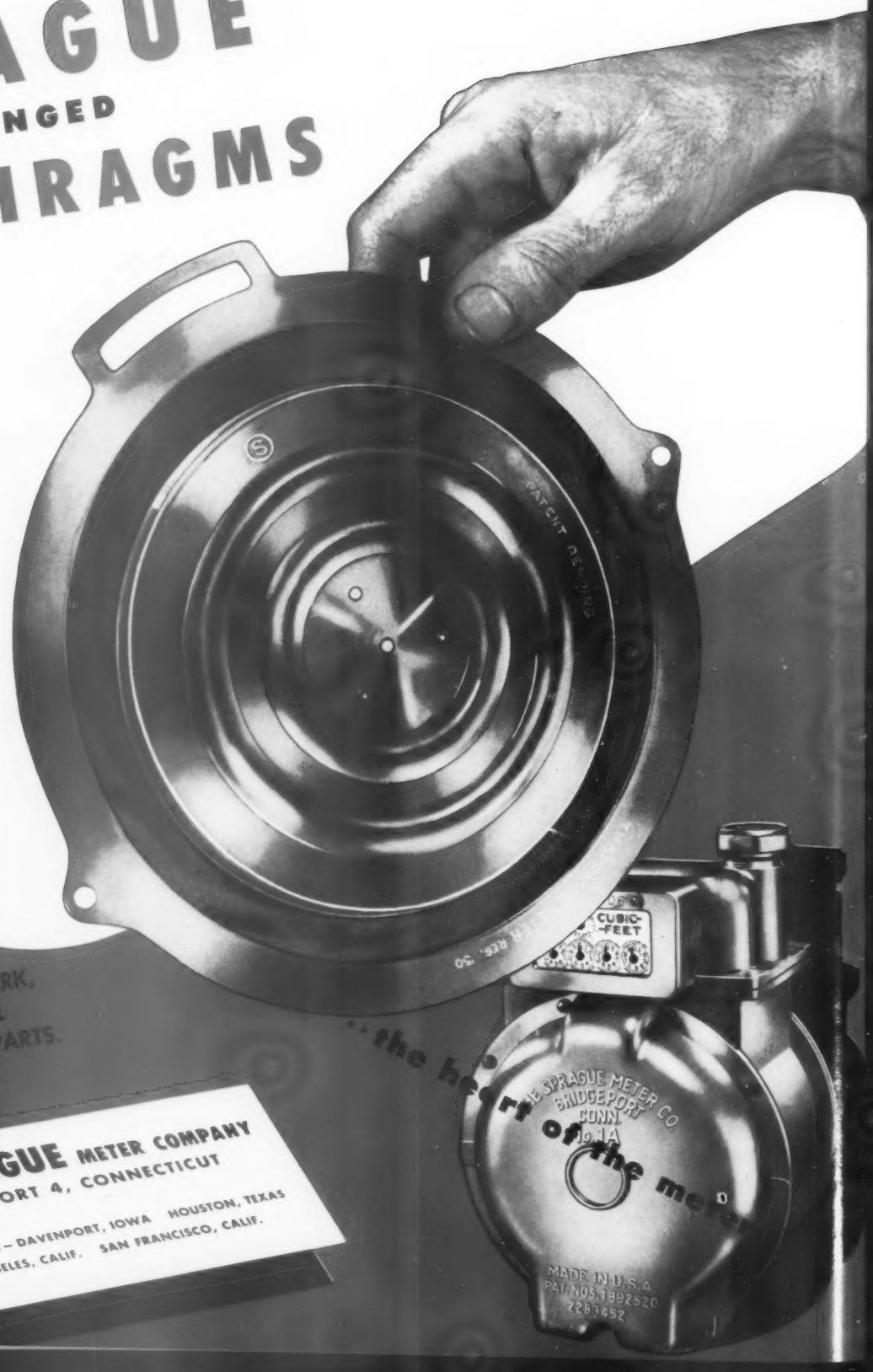

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OL. 178 No. 3 AMERICAN MARCH, 1953

APR 27 1953

Gas Journal

MAY 20 1953

EPENDABLE *Automatic* GAS PILOTS for RANGES and SPACE HEATERS

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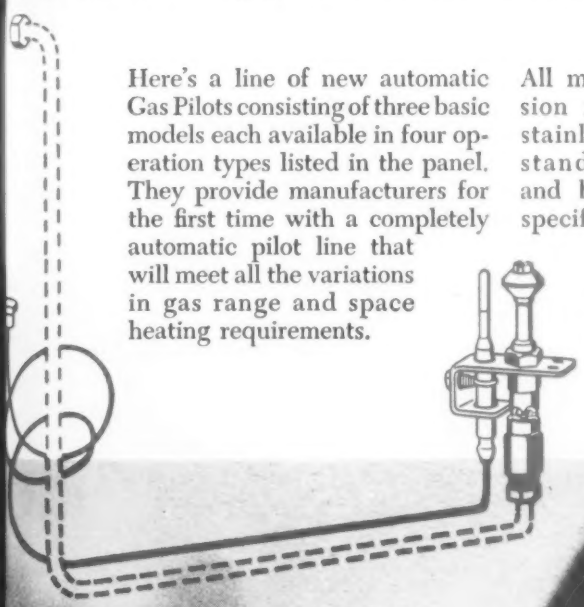

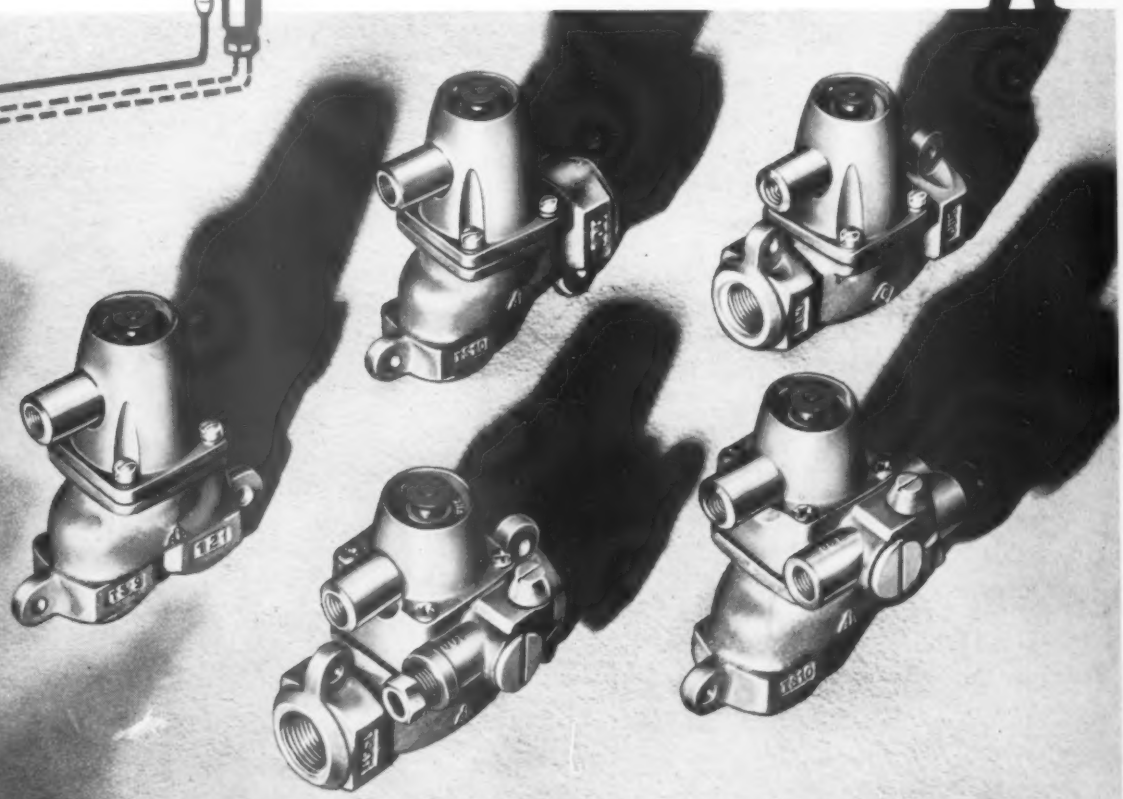

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TYPE C — With complete External 100% control whereby Pilot Gas Flow is completely divorced from Flow of Gas to Main Burner

TYPE D — With Pilot Gas take-off at the Control itself

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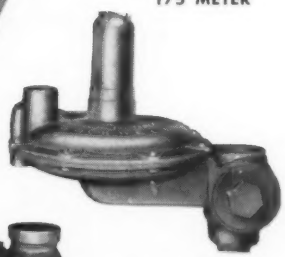
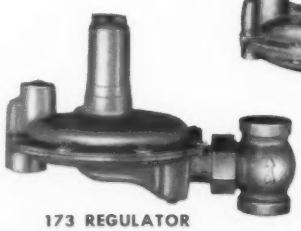


107 REGULATOR



173 REGULATOR

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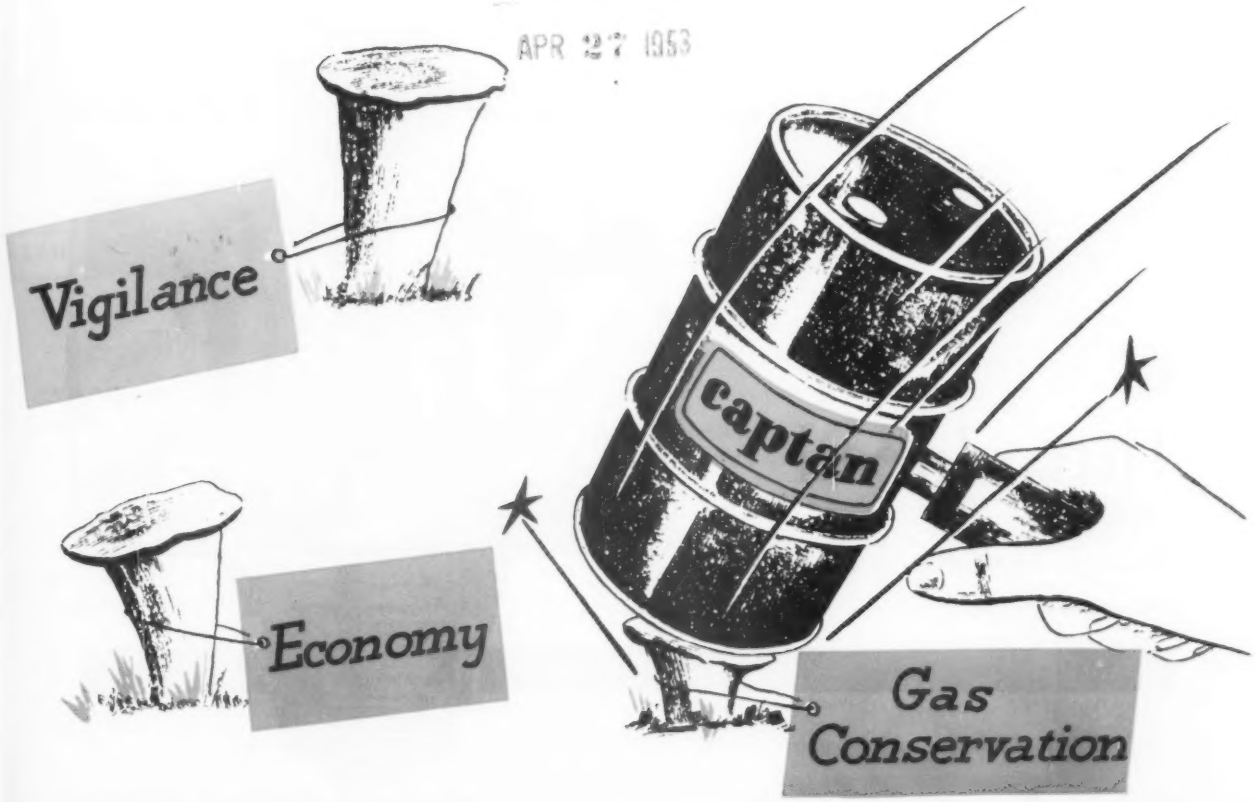

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Just a few weeks ago . . .

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AMERICAN Gas Journal
ESTABLISHED 1859

OLUME 178 MARCH 1953 NUMBER 3

This month...

We run an occasional Box Score in our How Wrong Can You Be department. This month we note we are batting 1,000. *Item 1.* Our prediction in November: Operation Sales, as proposed to GAMA last May, is as dead as a smelt. Verification: Operation Sales Starts in April (page 44). A somewhat bob-tailed version to be sure but nevertheless. . . . *Item 2.* Our prediction in October: Based on meteorological predictions, the winter of 1952-53 along the Atlantic Seaboard will be the coldest in a decade. Verification: It's been the warmest that we can remember, in these parts.

• • •

Our May issue, which has heretofore been called the Natural Gas Issue, will this year be dedicated to the Southern Gas Industry, and will be the *Southern Gas Association Issue.* It is high time that we salute the South, if for no other reason than that its gas industry has given us the largest percentage gain in paid circulation of any geographical area of the country. With our February circulation up 111%, nationally, since we bought AMERICAN GAS JOURNAL, the Southern States have shown an increase of nearly 200%.

• • •

American Gas Fundamentals students will observe that this month's chapter is the first installment in what will be, at the completion of the series, the only complete glossary of terms that we know of, in gas industry literature. It is too bad to have to run it piecemeal, but there are far too many words to be encompassed in any one month.

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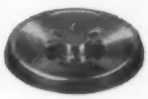

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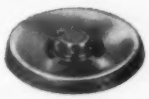

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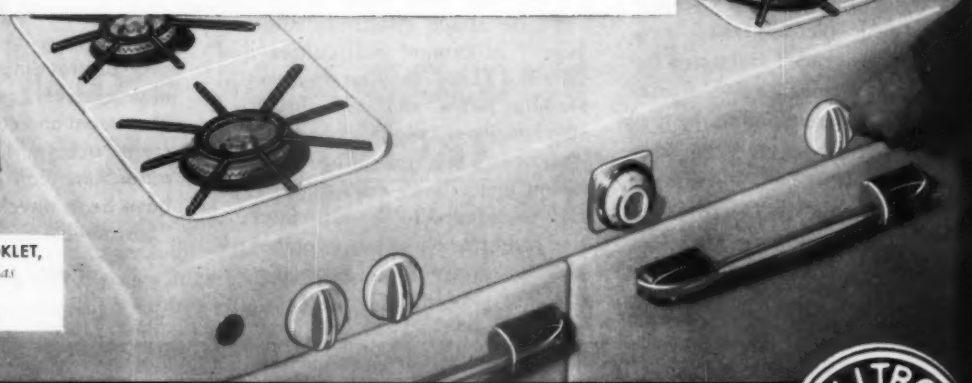

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AMERICAN GAS JOURNAL *Salutes . . .*

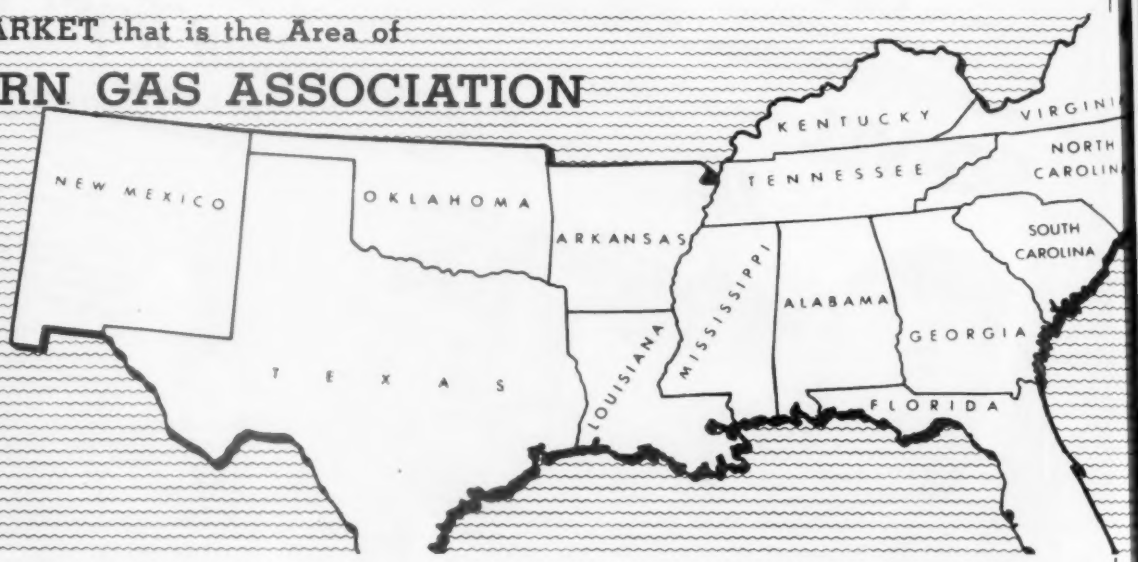
The Southern Gas Industry . . . with a

SOUTHERN GAS ASSOCIATION ISSUE

MAY 1953

The VAST MARKET that is the Area of

SOUTHERN GAS ASSOCIATION



THE OFFICERS of Southern Gas Association cooperated actively with the editors of AMERICAN GAS JOURNAL in formulating the contents of the May issue for the Association's 45th Annual Convention in New Orleans, May 11-13.

Now, they and member companies are assisting in preparing one of the most complete regional summaries of the gas industry ever published.

A salute to Southern Gas Association is, in effect, a salute to Natural Gas—and a salute to every gas utility that is a beneficiary of the gas supplies that the Southern States send forth.

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TOTAL	5,544

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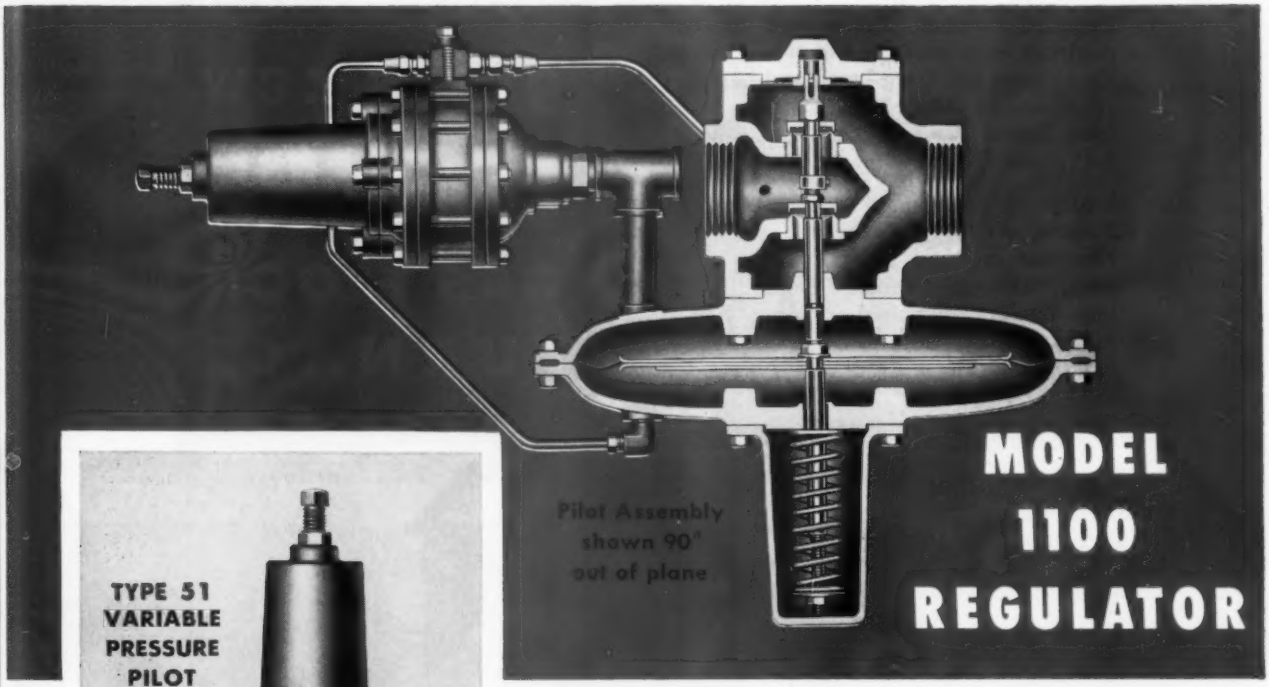

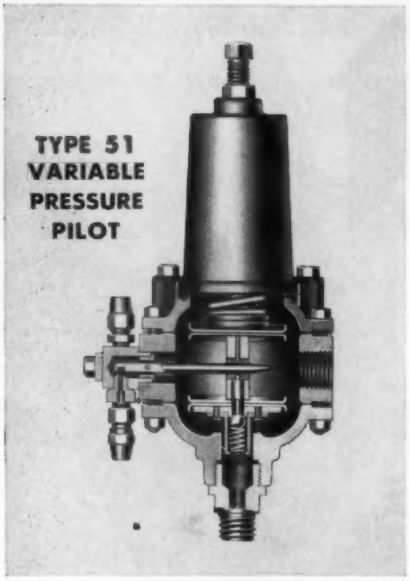

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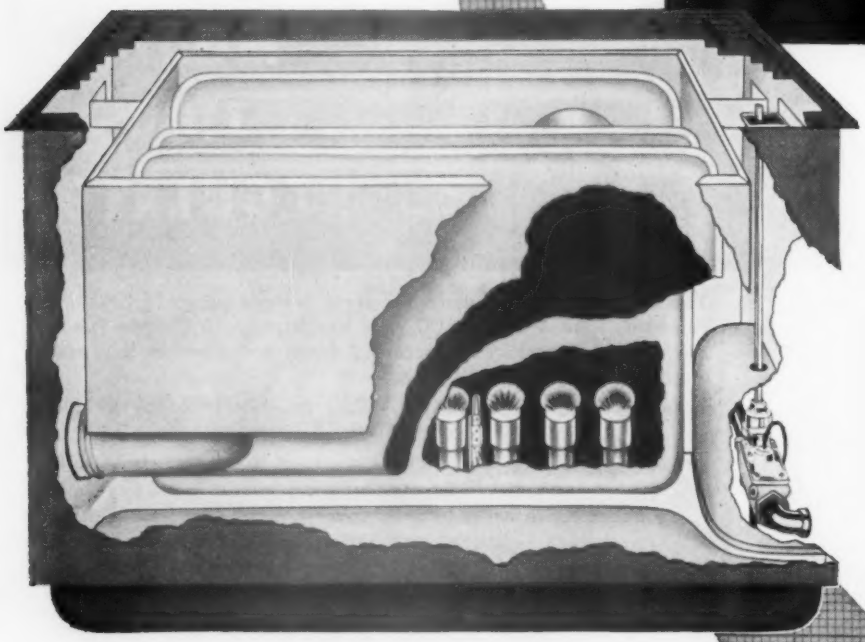

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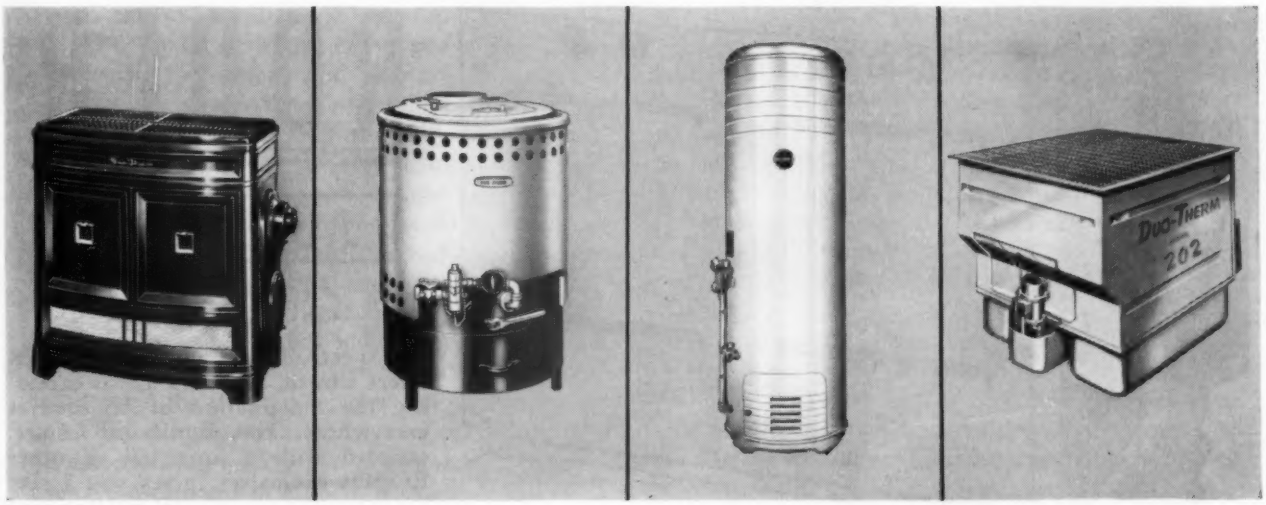
proof that when it comes to heating appliances, you can bank on Duo-Therm.



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9 models set new standards for performance and styling. All fully vented. Exclusive Equaflame Burner, Automatic Power-Air Blower, Comfort-Selector thermostat, All-in-One Control.

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Quality-built throughout for longer service. Heavy-duty tanks, thick spun-glass insulation, faster heating. Liberal 10-year Warranty. 3 sizes with either pilot-burner or burner shut-off.

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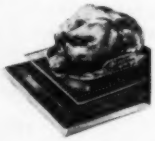


"Bake-Master" Oven with Automatic Heat Control and "Scientific" Cooking Chart

Editorial:

Bureaucratic Blunders

THE recent action of the Federal Power Commission in consolidating the New England hearings on the rival applications of Algonquin and Northeastern pipelines with Northeastern's project to export natural gas to Canada is the latest, and we hope the last, in a series of blunders that the Commission has made in violent disservice to the natural gas industry, to the New England distributing utilities and to the public in whose interest FPC is presumed to direct its labors.

The first mistake was undoubtedly the arbitrary and ill-considered division of the New England territory between the two contending pipeline companies. Neither one had asked for just a piece of the area. Both had predicated their plans on serving it as a unit. Each had held out enticing inducements to the local utilities to support its side of the case.

Hasseled and hauled around and badgered by the cut-price politicians in New England and in Washington, FPC finally came up, in November 1950, with what its majority-members no doubt regarded as a decision strictly from Solomon's notebook. They split the territory into what was unquestionably the most irrational and uneconomic division that has ever been made; gave part of it to Algonquin and part to Northeastern and fixed it fine, so nobody could make a dollar selling gas at the city gate rates that had originally been held out to the local gas companies.

The markets assigned to each were such that both were put to the expense of building long and expensive laterals to deliver gas to meagre terminal markets. Over many miles, the two systems now run parallel, at one point they actually cross, and natural gas delivered to the extreme southwestern part of Connecticut comes in from Texas, by way of Buffalo, N. Y.

Both companies started immediately to build their lines; but Transcontinental took the decision to the courts, meanwhile, on the grounds that it had been denied the right of proper hearing in opposition to Algonquin's certificate. The courts finally agreed, and in October 1952 the Commission was ordered to reopen the hearings, and Algonquin's certificate was voided. By this time, Northeastern's line was in service and Algonquin's was virtually complete.

FPC had obviously blundered again in granting a certificate under circumstances that would not hold up in court. In the meantime, some 25 cities in Massachusetts, Connecticut and Rhode Island that had expected natural gas service during the winter of 1952-53 were out on a limb, while the lawyers prepared for the new hearings. These included such important and populous centers as Boston, Providence, Waterbury, New Haven and Hartford to name but a few. In some instances, the local gas companies were desperately depending on the promised natural gas, and had the last winter not been unusually mild, severe hardship would probably have been the lot of many hapless New England consumers.

When Algonquin then requested a temporary certificate, pending the outcome of the reopened hearings, Federal Power Commission either got cold feet or took one more look at the lawbooks that they ignored when they granted the original certificates. They ruled that they didn't have the authority to grant such a certificate under the particular circumstances. It is worthy of note that Commissioners Claud L. Draper and Nelson Lee Smith dissented, saying that in their opinion "the Commission has, and should exercise in the interests of the public, authority to issue the temporary authorization." In our opinion, the majority blundered again.

Now, with the rehearings nearly complete, and with both sides having every reason to expect an early and final decision, and with the New England gas companies and their customers morally justified in demanding an early end to the uncertainty, the commission elects to introduce the Canadian factor into the problem.

This is strictly a four-bar hurdle, which not only involves an FPC decision on every phase of the applications, but also a Presidential Permit for facilities at the Canadian border to transfer gas across the line. Months will probably elapse before every phase of this vaguely-related project is explored. Who knows but that snow will again be falling in New England before the issue of complete service to that area is finally resolved.

We take no sides in the controversy between the transmission companies. In our artless and naïve way, we feel that an honest and sincere determination to serve the public interest should be the basis of every act by any regulated utility, even a natural gas pipeline. Of that lofty moral attribute we have seen no striking evidence on either side.

But, for the distributing utilities and the gas users to be the sorry victims of Federal Power Commission blunders, made not singly but in a monotonous series, is more than even a Puritan should be asked to bear.

Elliott Taylor

Small Portable Combustion Tube for Orsat Type of Gas Analysis Apparatus

by Myron L. Robinson
Southern California Gas Company

A COMBUSTION TUBE consisting of an electrically heated platinum spiral in a small quartz tube is described here for use in rapid, safe, single-pass combustion analysis of natural gas. Although the design has potentialities for use in portable equipment, the application shown here is on a laboratory model Orsat. A completely portable apparatus for rapid combustion analyses in the field is being considered.

No simple, safe, reliable apparatus is commercially available to rapidly burn natural gas samples for combustion analysis. The need is particularly great where portable equipment could be used for on-the-spot analyses such as at leakage investigations. It was believed that by passing the sample-oxygen mixture over an electrically heated platinum wire in a small enough capillar, rapid combustion could be performed in a safe manner.

A device has been reported but, after some experimentation, the design shown was not considered satisfactory for routine use because of large internal volume, insufficient heat resistance of the pyrex construction, large power requirement, large restriction to flow of gas by the flash arresters, difficulties in construction, cleaning and repairing; and in addition, single pass combustion was not possible.

Features of this design

The desirable features claimed for this design are:

1. Rapid one-pass combustion of the constituents of natural gas (three minutes actual combustion time). If applicable amounts of higher hydrocarbon vapors are present, one to three additional passes are required to desorb the portion on the walls of the apparatus.
2. Safe combustion even with explosive hydrogen-oxygen mixtures or natural gas containing up to ten per cent acetylene.
3. Rapid heating (30 seconds) and rapid cooling (one minute).
4. Low internal volume and surface area keeps the effect of temperature changes and adsorption to a minimum.
5. Fairly simple components that are easily disassembled for thorough cleaning or repair.
6. Stable, durable unit with long life.
7. Not rapidly deteriorated by Orsat fluids.
8. Small and light weight, no supports required.
9. Low electrical energy requirements (35 watts for three minutes per analysis); batteries may be used for portable field equipment.

Construction detail

The form of the combustion tube adopted, after considerable experimentation with pyrex capillary tubing and cement type glass-to-metal seals, is shown in the accompanying drawing. Basically, the unit consists of an electrically heated platinum spiral in a clear silica tube that is in the shape of the Greek letter "Pi." Extending from the horizontal arms of the "Pi" are electrodes that conduct the current to the platinum spiral which is located between the electrodes. One leg of the "Pi" is the combustion mixture inlet and the other leg the outlet. Both inlet and outlet contain flash-back arresters which are simply tightly-packed bundles of inert wire.

The dimensions shown are not very critical but were chosen for ease of construction and economy of materials and power consumption of the spiral.

In the small size suggested, clear silica tubing obtainable from General Electric may be satisfactorily worked in a gas-oxygen flame. The ends of the tube through which the electrodes pass should be ground square on an oil stone in order to make a good seal to the gasket.

The flash-back arresters are assembled by dropping a few lengths of wire at a time into the tube and arranging them to form a compact bundle. The last two or three wires should fit snugly and be long enough to extend to the open end of the tube to permit easy disassembly.

After the platinum wire has been welded to the nichrome electrodes, the spiral is formed by close winding the wire on a drill rod to give a spiral that loosely fits the inside diameter of the tube. It is necessary to space the first four or five turns at the inlet end about one wire diameter, to minimize local overheating on rapid combustion, and to space the remaining turns about one-fifth of a wire diameter to prevent short circuits. Also, prior to inserting the spiral and electrode assembly into the silica tube, it is important to free the spiral of finger prints with concentrated nitric acid and a water rinse.

The removable gas-tight seals between the electrodes and the silica tube are

RESULTS WITH COMBUSTION TUBE ON NATURAL GAS

Composition,[1][2] calculated, approx. (per cent)			Analysis No.	Composition found by combustion[2] (per cent) Methane	Ethane	Nitrogen	Btu.	Sp. Gr.
	Methane	98.8	1	98.4	0.5	1.1	1001	0.562
Low	Ethane	0.2	2	97.5	0.7	1.8	1003	0.565
Ethane	Nitrogen	1.0	3	99.4	0.0	0.6	1010	0.558
Sample	Btu	1000	4	98.7	0.1	1.2	1003	0.560
	Sp. Gr.	0.558						
	Methane	78	1	77.3	17.7	4.8	1101	0.664
High	Ethane	17.5	2	78.6	17.4	3.8	1109	0.658
Ethane	Nitrogen	4.5	3	77.6	17.8	4.4	1105	0.663
Sample	Btu	1098	4	75.9	18.6	5.3	1103	0.670
	Sp. Gr.	0.663	5	78.0	17.1	4.7	1098	0.661
			6	76.9	17.8	5.1	1099	0.666

[1] Composition based on calorimeter Btu and gravitometer sp. gr.
[2] Carbon dioxide, oxygen and other minor constituents not shown.

silicone rubber washers cut from one-to-two millimeter sheet stock, with cork bores, to fit tightly on the electrodes. Each seal is pressed against the end of the tubing by two small tension springs that are attached to the cooling fin riding loosely on each electrode. One end of each spring is covered with plastic insulating spaghetti to prevent short circuiting the current to the spiral.

Arrangement of orsat

Since the efficient operation of the combustion tube requires that all the combustion mixture be burned in a single pass, the arrangement of the pipettes on the Orsat must be changed to permit passage of mercury into the combustion tube as far as the flash-back arresters.

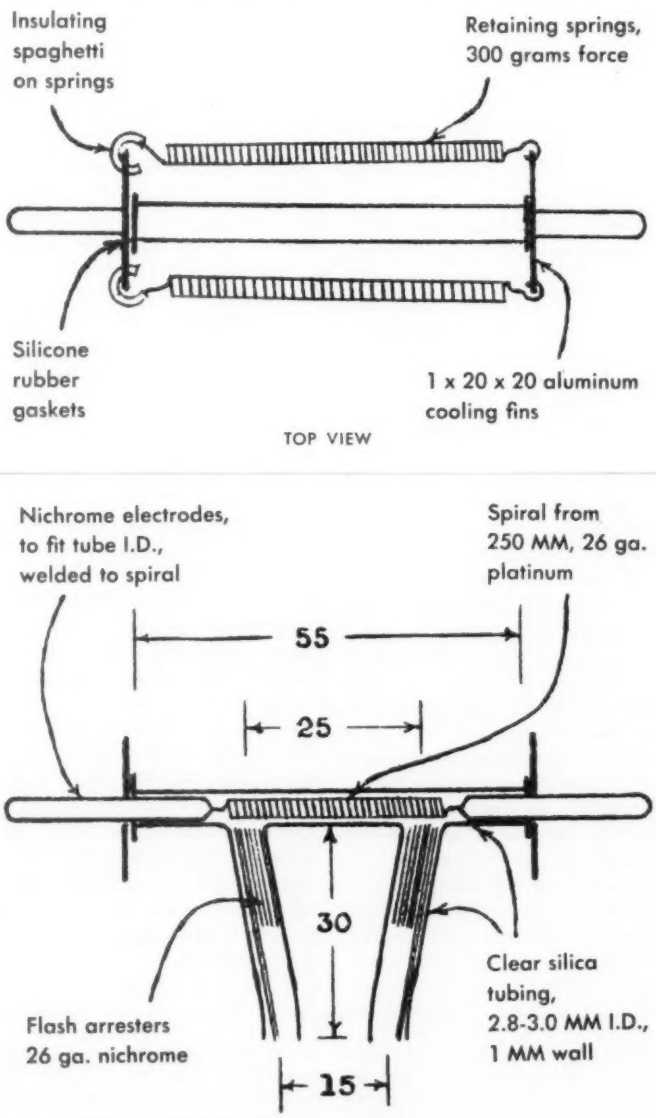
The recommended order of the components on the manifold from left to right, or vice versa if desired, is: three-way stopcock for entering and purging with oxygen, caustic-filled pipette for absorbing carbon dioxide after combustion, mercury-filled reservoir with leveling bulb, combustion tube coupled to the manifold by a Burrell No. A39-825 U-tube stopcock, burette assembly of the type with water jacket and compensator manometer, pipette for absorbing oxygen, caustic-filled pipette for absorbing carbon dioxide in the sample, three-way stopcock for entering and purging with the sample.

It has been found helpful in rapidly and accurately balancing the pressure in the burette to use dibutyl phthalate in the compensator manometer. Since the sensitivity is increased about 15 times by this fluid, it is advisable to put a pressure manometer on the mercury in the burette to prevent blowing the dibutyl phthalate. This pressure manometer, which is tied to the water jacket, is merely a three-foot-long glass tube open at the top and connected at the bottom, by means of a tee, to the rubber tube leading from the burette to the leveling bulb. When the mercury levels in the burette and this manometer are the same, the pressure in the burette is atmospheric.

Additional pipettes may be added to the right of the burette for other operations on the sample such as carbon monoxide or unsaturants-removal.

With this logical arrangement, all operations pertaining to the sample are carried out on the right side of the manifold, and all operations pertaining to combustion are carried out on the left side, in addition to allowing mercury from either the reservoir or the burette to force the combustion mixture through the combustion tube in one pass. The construction of the Burrell "build up model" Orsat is ideal for this arrangement of the pipettes.

THE SMALL PORTABLE COMBUSTION TUBE


Insulating spaghetti on springs
Retaining springs, 300 grams force
Silicone rubber gaskets
1 x 20 x 20 aluminum cooling fins
TOP VIEW
Nichrome electrodes, to fit tube I.D., welded to spiral
Spiral from 250 MM, 26 ga. platinum
55
25
30
15
Flash arresters 26 ga. nichrome
Clear silica tubing, 2.8-3.0 MM I.D., 1 MM wall
CUTAWAY SIDE VIEW
Full scale, dimensions in millimeters

The combustion tube, when mounted on the stopcock, requires no additional support, but the electrical connection to the electrodes should be made through flexible leads and alligator clips in a manner to prevent moving the electrodes to badly deform the spiral. A source of electric current of approximately six amperes at five volts for three minutes per analysis is required. A suitable transformer or battery and rheostat is satisfactory.

The combustion tube is rinsed with water at the start of a day's run, together with the manifold. Excess water is removed by turning on the current to the spiral while a small flow of oxygen is purged through. The tube is cooled and kept full of oxygen until needed. No deviation from the customary procedure for handling the sample is required up to the point of carrying out the combustion.

After the sample and oxygen have been measured and mixed, the mercury from the reservoir is raised to the stopcock of the combustion tube and the stopcock to the reservoir closed. All the combustion mixture is now on the burette side of the combustion tube. The stopcock to the combustion tube is now opened and the heating current turned on. After approximately 30 seconds to allow the spiral to heat, the stopcock to the reservoir is opened and the sample burned at a rate of not more than 70

(Continued on page 40)

Soil Corrosion Rate Measured Electrically

RECENT laboratory studies by National Bureau of Standards proves for the first time that the rate of weight-loss of steel corroding normally in soil can be measured electrically, without actually weighing the metal. Although the NBS measurements were restricted to the laboratory, the study gives further evidence that the electrochemical theory of corrosion applies generally to soils. The success of the work suggests valuable practical applications, such as determination of the corrosion rate of underground structure without the need for visual inspection.

When iron or steel is exposed to the soil, local differences in electrical potential develop at the surface of the metal, resulting in the formation of numerous small corrosion cells. This means that electric currents flow through the soil from certain areas (anodes) to areas of less negative potential (cathodes), with accompanying discharge of hydrogen ions at the cathodes and loss of metal from the anodes. By Faraday's law, the rate of weight loss from corrosion is proportional to the current.

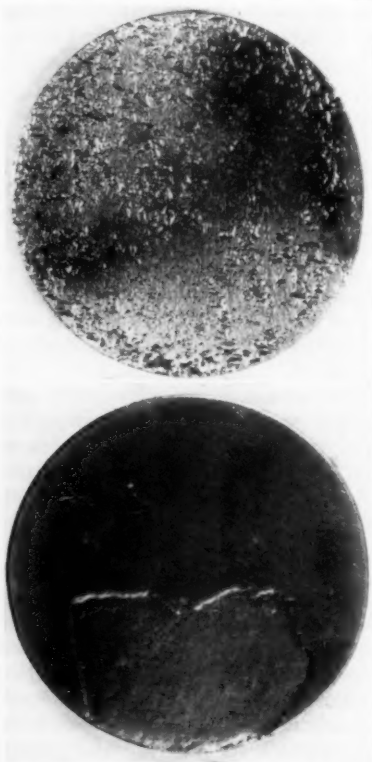
The NBS-demonstrated measuring technique is based on a relation established by other investigators, who showed that the current in a corrosion cell can be expressed in terms of the values of anodically and cathodically (positively and negatively) applied direct current, from an external source, that will just reduce the cell current (corrosion current) to zero. The relation is

$$i_c = \frac{I_p I_a}{I_p + I_a}$$

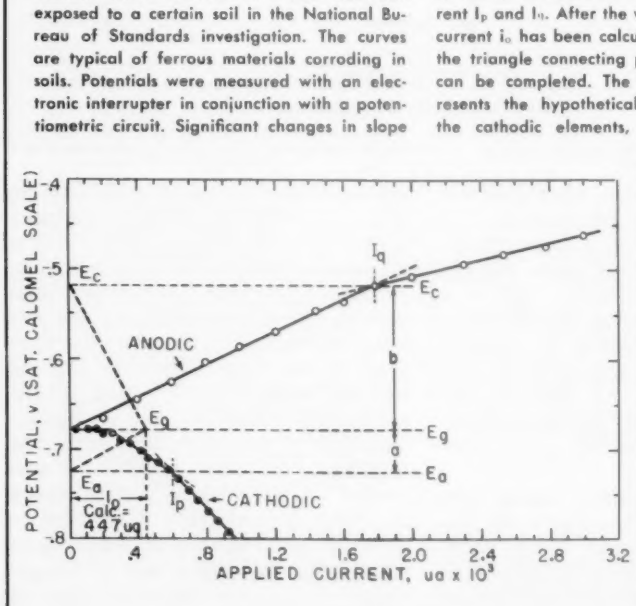
where i_c is the corrosion current, and I_p and I_a are, respectively, the cathodically and anodically applied currents required to reduce the corrosion current to zero.

As increments of current are applied, the potential of the cell changes. When the measured potentials are plotted against the applied currents, a change in the slope of the curves usually marks the points (I_p and I_a) at which the applied currents have reduced the local corrosion current to zero.

The corrosion cells used by previous investigators, in confirming the equation experimentally, contained separated anodes and cathodes, so that I_p and I_a could be directly measured and the corrosion currents computed therefrom compared with values obtained by direct measurement. However, when a single piece of metal is exposed to a corrosive medium, as in the NBS study, it is obviously impossible to measure these currents directly. Here the corrosion current, made up of innumerable small cell currents, must be determined indirectly, if at all, from changes in slope of the current-potential (polarization) curves. The NBS study demonstrates for the first time that the total corrosion current i_c—and thus the weight loss—of a single piece of metal normally corroding in soils, and presumably in other aqueous media, can be determined by the equation, from values of I_p and I_a obtained from the changes in slope of the cathodic and anodic polarization curves.



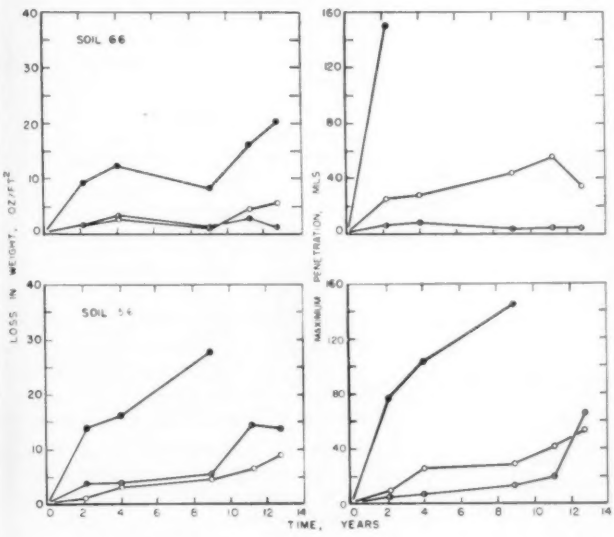
SOIL CORROSION of steel specimens exposed for 2 months in the National Bureau of Standards corrosion laboratory. The top specimen was exposed to acid soil (pH 2.9); the bottom specimen to alkaline soil (pH 9.5). The Bureau's study demonstrates that the rate of corrosion of laboratory specimens can be determined indirectly by electrical measurements, without direct examination or weighing.



POLARIZATION CURVES of a steel electrode exposed to a certain soil in the National Bureau of Standards investigation. The curves are typical of ferrous materials corroding in soils. Potentials were measured with an electronic interrupter in conjunction with a potentiometric circuit. Significant changes in slope of the curves occur at values of applied current I_p and I_a. After the value of the corrosion current i_c has been calculated from I_p and I_a, the triangle connecting points E_c, E_g, and E_a can be completed. The line E_c-E_g then represents the hypothetical polarization of all the cathodic elements, and the line E_a-E_g applies similarly to the anodic elements; these lines show whether the reaction is cathodically or anodically controlled. The current I_p is the value required to prevent corrosion, commonly known as the current needed for cathodic protection. This current was found at NBS to bear a relatively fixed relation to the corrosion current i_c, so that the latter can be estimated from the former.

In establishing the feasibility of the indirect measuring technique, weighed steel specimens, differentially aerated, were exposed at the Bureau to five corrosive soils for approximately two months. The soils ranged in reaction from very acid (pH 2.9) to very alkaline (pH 9.6). Because of the possibility of changes in rates of corrosion during the two-month period, polarization curves were obtained at intervals throughout the exposure period. At the end of this period the specimens were removed from the soils, cleaned, and reweighed. Actual weight losses were compared with weight losses calculated indirectly by Faraday's law, using values of corrosion current (i_c) obtained from the equa-

Effective Protection of Galvanized Coating Studied by National Bureau of Standards



WEIGHT LOSS (left) AND MAXIMUM PENETRATION (right) curves for specimens exposed to corrosion in two different soils for periods up to 13 years. Solid circles, bare steel pipe; open circles, zinc plate; half-solid circles, galvanized steel pipe. Enough specimens were buried to permit removal and inspection of two specimens of each material from each soil at the end of each of five different periods. In some of the soils, including soil 56 (Lake Charles clay), galvanized specimens continued to corrode throughout the 13-year period. In many other soils, including soil 66 (Mohave fine gravelly loam), corrosion of galvanized specimens was negligible in comparison with the bare steel specimens.

tion on the basis of values of I_p and I_n indicated by changes of slope in the polarization curves. The calculated values of weight loss differed on the average from the actual values by approximately 4 per cent.

This technique for indirect electrical measurement of corrosion rate appears to have possibilities for extensive application both in the laboratory and in the field. In laboratory determinations of the corrosion rate of certain materials, for instance, the weight loss resulting from corrosion might actually be exceeded by the cleaning error. The electrical method makes possible much more accurate comparisons of the corrodibilities of such materials.

For field determination of underground corrosion the electrical method, if it proves practicable in the field as well as the laboratory, would have several advantages in addition to obviating the need for excavating the underground object. Although in some soils ferrous metals corrode at a constant rate year after year, in other soils corrosion gradually slows down and in time may virtually cease. Actual weighing or inspection of an object that has been buried for years will indicate how much total corrosion has occurred, but will not show how rapidly, if at all, it has been corroding just prior to inspection.

The electrical method, on the other hand, measures the present corrosion rate, which is likely to be of greater practical interest than the history of past corrosion. Furthermore, the electrical method does not involve the removal of corrosion products, which often inhibit corrosion.

The corrosion weight-loss studies were conducted by W. J. Schwerdtfeger and O. N. McDorman of the NBS corrosion laboratory.

Corrosion of buried galvanized steel

Another recent study of underground corrosion by National Bureau of Standards gave particular attention to hot-dipped galvanized steel pipe. Results confirm previous NBS work in showing that galvanized steel having 3 ounces of zinc per square foot of exposed surface is highly resistant to corrosion in many soils which are very corrosive to bare steel.

The Bureau's study was based on short lengths of both galvanized and uncoated steel pipe, and also plates of zinc, buried at 15 test sites for periods up to 13 years. The test sites represented a wide range of soil properties and were located in widely separated parts of the United States.

After each of five periods of exposure, a set of specimens of each material was removed and returned to the NBS laboratories. After removal of the corrosion products, determinations were made of loss in weight, depth of the deepest pits, and the percentage of area of the galvanized specimens on which coating remained.

Although the nominal weight of the zinc on all the coated specimens was 3 ounces per square foot, the actual thickness varied over a wide range. This was shown by a large number of thickness measurements made by a magnetic method, using unexposed samples of pipe from the same lot as the buried specimens. Additional determinations by an electrolytic stripping method showed that a large part of the zinc that was applied to the steel pipe was converted into alloys of zinc and iron.

The zinc coatings provided good protection in most of the soils. In one soil in which bare steel pipe was perforated by corrosion after exposure for only a few years, the coating on the galvanized specimens remained perfectly continuous throughout the entire 13-year period. The zinc coating was found to have negligible protective value in only two of the 15 soils, both organic.

An interesting finding of the NBS study was the high corrosion resistance that the galvanized specimens continued to show in most of the soils after the outer zinc coating, and even after the zinc-iron alloy layer, had corroded away entirely. This continuing protection is tentatively attributed to an inorganic coating, probably silicious, believed to have been deposited by galvanic action between the outer zinc coating and the underlying steel or alloy layer. This tentative explanation is based in part on unpublished studies which indicate that the zinc-iron alloy layer does not protect steel sacrificially (cathodically), and that the alloy is no more resistant than steel to soil corrosion.

Analysis of the data obtained in the course of the two NBS field studies shows that the minimum weight of zinc coating required to protect steel for a minimum of 10 years depends on the nature of the soil environment. In the NBS studies a 2-ounce coating gave sufficient protection in inorganic oxidizing soils, but for inorganic moderately reducing soils a 3-ounce coating was required. Highly reducing soils, both organic and inorganic, require coatings heavier than 3 ounces per square foot.

In order to obtain maximum life from galvanized pipe in practice, it is necessary either to construct the entire piping system of galvanized pipe or else to electrically insulate the galvanized sections from pipe of other metals. Otherwise, the zinc coating will be removed by galvanic action.

The studies of underground corrosion of galvanized steel were conducted by Irving A. Denison and Melvin Romanoff of the Bureau's corrosion laboratory.

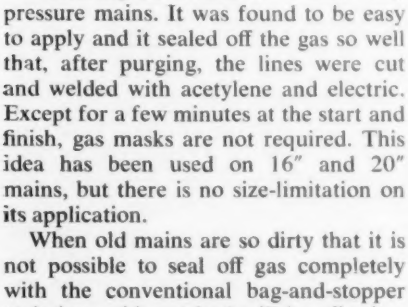
Safe Way of Making Cutouts on Large Low-Pressure Gas Mains

by H. T. Libby
Superintendent, Gas Distribution
British Columbia Electric Co., Ltd.

THE plan described and illustrated here was worked out and used successfully on several 16″ and 20″ low pressure mains. It was found to be easy to apply and it sealed off the gas so well that, after purging, the lines were cut and welded with acetylene and electric. Except for a few minutes at the start and finish, gas masks are not required. This idea has been used on 16″ and 20″ mains, but there is no size-limitation on its application.

When old mains are so dirty that it is not possible to seal off gas completely with the conventional bag-and-stopper technique, this method will be effective, as established in practical applications.

Step 1



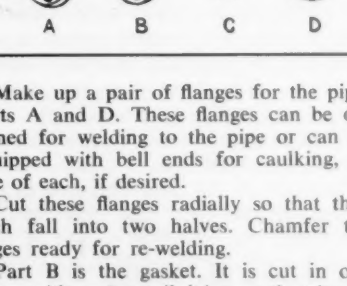
Make up a pair of flanges for the pipe, parts A and D. These flanges can be designed for welding to the pipe or can be equipped with bell ends for caulking, or one of each, if desired.

Cut these flanges radially so that they each fall into two halves. Chamfer the edges ready for re-welding.

Part B is the gasket. It is cut in one place with a dovetail joint so that it can be put over the pipe. If gas is coming both ways in the pipe to be cut, two gaskets for each pair of flanges are desirable.

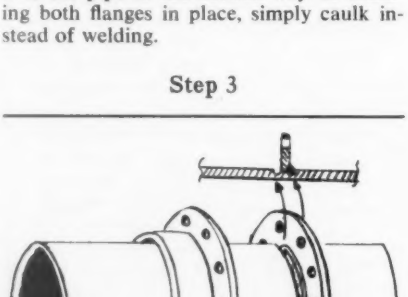
Part C is a blanking plate made of 10 gauge iron, sized to fit *just inside the bolt circle*, with a handle left on it.

Step 2



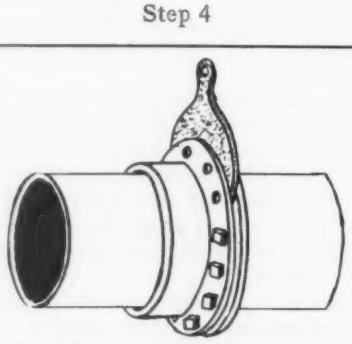
Assemble the two flanges on the pipe with the radial cuts at right angles to each other, so that each flange acts as a splint for the other. Make the welds necessary to restore the flanges to their original form. Line up flange D with the pipe and weld it to the pipe in the normal way. If caulking both flanges in place, simply caulk instead of welding.

Step 3



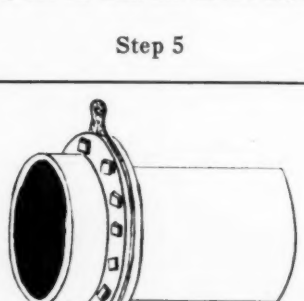
Unbolt the flanges and slide the loose one out of the way. Use a cape chisel in a pneumatic gun, groove the pipe as deeply as possible, without actually parting it. If there is a break-through, plug the leak with red lead putty, or something similar. Make the groove about ⅜″ wide. This can be done well in advance of the cutout. When ready to cut out, part the pipe with the use of a parting chisel in the air gun. A special chisel should be used that gives a cut at least ¼″ wide. Follow the chisel by caulking wet rags into the cut. Men doing this work require gas masks. When the pipe is entirely parted, cement the gaskets to the flanges, using Permatex or a similar gasket cement.

Step 4



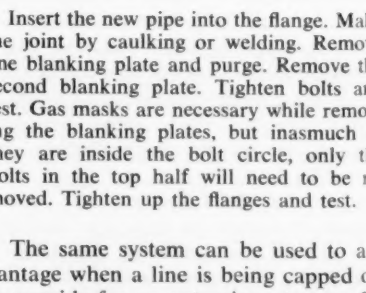
Remove the rags, look through the cut to make sure that it is clear, grease the blanking plate, C, and insert it. Grease makes it easier to insert and remove the plate, and prevents the gasket from sticking to it. Bring up the companion flange and bolt tight. If a diversion is being made, of course two such installations will be required, one on each end of the diversion.

Step 5



Purge the pipe between the blanking plates and proceed with the cutout. No gas will be present and oxyacetylene may be used for cutting.

Step 6



Insert the new pipe into the flange. Make the joint by caulking or welding. Remove one blanking plate and purge. Remove the second blanking plate. Tighten bolts and test. Gas masks are necessary while removing the blanking plates, but inasmuch as they are inside the bolt circle, only the bolts in the top half will need to be removed. Tighten up the flanges and test.

The same system can be used to advantage when a line is being capped off to provide for an extension at some future date. If a pair of companion flanges and a blanking plate are used to finish off the line, the extension can be completed, tested and be ready for service before any gas is introduced. Then, it can be put into service simply by pulling the blanking plate.

Adapted from a presentation to Pacific Coast Gas Association Technical Services Conference February 1953

Tractor-Trencher Advantages Shown by Citizens Gas and Coke Utility

IN the midst of an expansion program, Citizens Gas and Coke Utility, Indianapolis, has employed the use of a tractor-driven trencher that digs a 300-foot trench, 42 inches deep, in an hour, a performance that equals the labor of 25 men working the same time with hand tools. This substitution of man-power with machine-power enables the company to place 25 men to work on additional gas installations.

The Everett trencher used by Citizens Gas and Coke Utility can dig a trench that is 12 to 18 inches in width, cutting at the rate of 1½-to-5 lineal feet per minute. Additional trenching width, to 36 inches, can be made by widening the tractor tread and making two passes.

The machine is as mobile as the tractor upon which it is mounted and can be driven up inclines and over curbs and other obstructions right to the job site. The trencher itself has a shipping weight of 1,540 lbs. and a speed-reduction transmission with fingertip control. Necessary tractor speed-reduction is provided for by the transmission which permits the operator to select the proper rate of forward travel for the trencher, when in operation, by using the shift control lever. The operator can control the forward speed from a slow of 18 inches per minute for digging, to 15 mph for road transportation.

Four forward speeds and a governor control of the engine's rpm provide control over digging speed which must be changed to contend with varied soil conditions that are encountered. All the controls for lowering or raising the trencher are hydraulically controlled from the driver's seat.

Once the Everett speed reduction transmission has been installed, the trencher mechanism can be removed or reinstalled in 30 to 45 minutes. And installation of the transmission does not affect the regular use and operation of the tractor, without the trencher. The speed reduction transmission reportedly lengthens the tractor wheel base, stabilizes the trencher for easier straight-line digging, and assures better operation when the ground is not level. The gear ratio of speed reduction is 98-to-1.

A built-in feature of the unit is a safety slip clutch which automatically stops the bucket line and prevents damage when obstructions such as pipe lines, heavy roots and large rocks are met. The buckets, 15 in all, are spaced 12 inches apart. Each bucket measures 9¼" x 6" x 4".

THE TRACTOR-TRENCHER IN ACTION

Straight-line trench digging from 1½-to-5 lineal feet per minute.

Trencher in action showing side-arm delivery of dirt from excavation.

Photos: The Gas Flame, Citizens Gas and Coke Utility

Ample Funds in Prospect for Utility Expansion at Higher Interest

by John F. Falvey

Financial Editor

UNITED States Government bonds have joined corporate issues in a trend to lower market levels. Governments now are yielding in the neighborhood of 2⅞ per cent; and the return on prime corporates has increased another five points, to bring the yield to 3.09 per cent.

John F. Falvey

In their action both groups have geared themselves entirely to the outlook for the Government bond market, where higher interest rates are anticipated a few months hence, due in part to the expectation that the Treasury may issue a security of longer term maturity than any now outstanding.

The Treasury took its own step recently toward higher rates by replacing maturing 1⅞ per cent certificates with new 2¼ per cents, whereas the market had been looking for a 2⅛ per cent rate on the new issue.

This is the first certificate offering in many years with a rate higher than two per cent, and its immediate effect is expected to be a short-term firming in interest rates becoming apparent in the spring when the corporate demand for funds reaches its seasonal peak.

Seasoned market observers incline to the belief that the Treasury probably will permit market conditions at the time of its long-term borrowing to govern terms. In such event a continuing heavy corporate demand for funds might mean a rate of 3⅛ or 3¼ per cent for a Treasury bond in the event a 30-year maturity is selected.

It is far from a foregone conclusion, however, that corporate demand for funds will continue heavy enough to use up the supply now indicated as likely to be available this year.

A study made by the investment banking firm of Salomon Brothers & Hutzler, with the aid of a panel of investment specialists, indicates the supply of funds this year from all sources at $12.2 billion, with demand set at $12 billion. Of the available funds life insurance companies—long the main source—are expected to account for $4.8 billion, or roughly 40 per cent; savings and loan associations $3.5 billion; and private pension funds $1.1 billion.

The same conclusion, but not quite so definite, has been expressed by the research department of Bankers Trust Company, in the words of Roy L. Reierson, vice-president, "The projections for 1953 show that the demand for investment funds in the four major sectors covered in these tables (namely, private construction, corporate business, state and local governments and the treasury) will be no larger this year than in 1952, and will probably be slightly smaller in the aggregate.

"On the other side, the flow of savings through the major savings institutions (namely, banks, insurance companies and savings and loan associations) will be no lower in 1953 than it was last year, and may conceivably be slightly larger. This suggests that economic forces are not likely to operate in the direction of a persistent upward trend in long-term interest rates in 1953.

"Naturally in making these projections for 1953 we had to have in mind a general pattern of economic conditions and developments. These projections reflect the following points of view: (1) economic activity, including building, construction and plant investment, will be well maintained for the year as a whole; (2) there will be no resurgence of inflationary pressures; (3) the accumulation of business inventories, which began in the fall of 1952, will continue at least through the first half of 1953; (4) Government spending will rise only slightly from current levels; (5) present tax laws will not be changed and, consequently, the excess profits tax will be allowed to expire as of June 30, but individual income tax rates will not be reduced until 1954; (6) there will be some reduction in the Treasury cash balance by the end of 1953, in contrast with a large increase in 1952, so that the new financing requirements of the Treasury will be about the same in calendar 1953 as they were in 1952; (7) an effort will be made to lengthen the average maturity of the Treasury debt and a long-term marketable Treasury bond ($2 billion or less in amount) will be offered later in 1953."

Several factors may be cited in support of the expectation that corporate needs for funds this year will fall short of the 1952 level. Internal sources are estimated to produce no less than 70 per cent of corporations' money requirements in 1953, compared with less

(Continued on page 40)

INDEX OF YIELDS : SELECTED UTILITIES STOCKS

	Feb. 1953	Jan. 1953	Dec. 1952	Nov. 1952	Oct. 1952	Sept. 1952	Aug. 1952	July 1952	June 1952	May 1952	Apr. 1952	Mar. 1952
Natural Gas Transmission Companies	3.95%	4.04%	4.04%	4.14%	4.48%	4.44%	4.10%	4.01%	3.98%	4.05%	4.08%	4.03%
Natural Gas Transmission & Distribution Companies	4.91	5.02	4.99	5.14	5.47	5.45	5.30	5.26	5.28	5.32	5.34	5.14
Manufactured & Mixed Gas Companies	4.65	4.87	4.83	5.00	5.04	4.80	4.70	4.89	4.84	5.06	5.13	4.99
Class "A" Electric Companies	5.05	5.08	5.10	5.20	5.40	5.39	5.40	5.49	5.60	5.54	5.65	5.51
Class "B" Electric Companies	5.08	5.19	5.08	5.19	5.47	5.42	5.46	5.51	5.55	5.57	5.61	5.48

This is a straight arithmetical index of comparative yields obtainable on a selected group of gas and electric utility industry common stocks.

The companies comprising this index have been selected by the AMERICAN GAS JOURNAL as providing a representative cross-section of each industry, from the standpoint of geographical diversification and of the relative importance of the individual companies in their areas.

No effort has been made to weight the average to give effect to changes in capitalization or in dividend rates because the yields afforded on the issues reflect such changes. The index is designed to show the rate of return and not necessarily market movements on the stocks comprising it.

This index is compiled from: natural gas transmission companies, 5; natural gas transmission and distribution companies, 5; manufactured and mixed gas companies, 4; class "A" electric companies, 4; class "B" electric companies, 5.

FEDERAL POWER COMMISSION

Southern Natural's Expansion Approved

Southern Natural Gas Company has been authorized to construct facilities to increase the daily delivery capacity of its natural gas pipeline system from 670,000,000 cubic feet daily to 1,020,000,000 cubic feet daily.

The Southern Natural project will extend the company's system from its present southeastern terminus near Bass Junction, Ga., to Aiken, S. C., and Savannah, Ga. In addition to service to the South Carolina and South Georgia companies, new customers to be served through the facilities include seventeen communities in Alabama and Georgia; the Southeast Alabama Gas District; South Atlantic Gas Company, which now distributes manufactured gas in Savannah, Ga.; and seven direct industrial customers. In addition, Southern was directed to supply natural gas to five other Georgia communities. Service to other municipalities in Alabama and Georgia will result from the authorizations granted by this decision.

Southern's construction program, estimated to cost $44,932,600, includes about 522 miles of pipeline additions to the company's existing system together with 9,800 horsepower in compressor capacity, and approximately 270 miles of new pipeline and a new 4,400 horsepower compressor station. The Commission already has granted temporary authorization for the construction of about 109 miles of the pipeline covered by this decision.

New Hearings Ordered on United's Offshore Gas

Additional hearings have been ordered on an application by United Gas Pipe Line Company to construct about 31 miles of natural gas pipelines extending from an off-shore field in the Gulf of Mexico to a connection with the company's existing system.

The Commission ordered the additional hearings, to be held at a time and place to be fixed by further order, as it modified and affirmed a decision filed last November by the FPC Presiding Examiner. The decision denied United's application without prejudice to the company's right to file a later application, if and when it had available natural gas reserves which would make the project economically feasible.

The Commission said that United has not proved sufficient available gas reserves to justify construction and operation of the proposed pipeline. The Commission also pointed out that a substantial and relatively inexpensive supply of gas would be available to United through the project. Drilling operations in the area covered by the contract should reach the 14,000 foot depth, from which United claims the bulk of the gas reserves to support its application, "within a reasonable time." The Commission added that "it is appropriate on the particular facts of this case" that United be given further opportunity to present evidence.

Chairman Thomas C. Buchanan and Commissioner Claude L. Draper dissented. Chairman Buchanan said that he thought the application should be denied.

Four Applications Consolidated with New England Hearings

The Commission consolidated four additional applications with the proceedings now in progress involving competitive proposals for natural gas service in New England.

The additional applications include (1) a joint request by Tennessee Gas Transmission Company, of Houston, Tex., and Niagara Gas Transmission Limited, of Toronto, Canada, for authority to export gas to Canada; (2) a request by Tennessee for a recommendation for a Presidential Permit covering facilities at the U. S.-Canadian border to export the gas; (3) an application by Tennessee for an FPC certificate for pipeline facilities in the United States to enable it to transport the additional gas for export; and (4) a proposal by Tennessee to increase deliveries of natural gas to its subsidiary, Northeastern Gas Transmission Company.

Texas-Ohio Denial Affirmed

The opinion and order issued last November 7, denying applications by Texas-Ohio Gas Company, for authority to construct a 1,406-mile pipeline and to import natural gas from Mexico has been affirmed by the Commission as final.

The Commission by order issued December 31 designated the November 7 opinion as a tentative decision, and parties to the proceeding had 20 days in which to file exceptions. Exceptions were filed by Texas-Ohio, Reserve Natural Gas Corporation, and the Public Utilities Commission of Ohio. Texas-Ohio planned to sell all of its gas to Reserve Natural, a newly-formed corporation, at the terminus of the proposed line near Lancaster, O.

In affirming the November 7 opinion as its final decision, the Commission said it was not adopting the "Findings and Conclusions in Lieu of Tentative Decision" submitted by Texas-Ohio and Reserve Natural because it found that Texas-Ohio "on the whole record has not made a showing that it has an adequate supply of gas to warrant the issuance of a certificate. . . ."

Tennessee Files to Transport for Iroquois and Niagara Cos.

Tennessee Gas Transmission Company has filed an application for authority to build facilities to transport natural gas for the account of Iroquois Gas Corporation of Buffalo and Niagara Gas Transmission Limited of Toronto. The two companies have purchased gas in Texas and Louisiana and would contract with Tennessee to transport the gas to the points in New York state where their systems intersect the lines of Tennessee.

The volume to be transported for Iroquois would be 48,752 Mcf per day; for Niagara, 60,700 Mcf.

Facilities costing $91,718,000, which would be constructed, include a 574-mile 30" pipeline from Kinder, La. to join the present Tennessee system at Portland, Tenn.; approximately 130 miles of loop line in Texas, Louisiana, Ohio and Pennsylvania; a 45-mile, 20-inch spur line from the Tennessee line near Buffalo to a point on the United States-Canadian border near St. Catharines; a submerged crossing of the Niagara River; 17,520 additional horsepower at existing compressor stations, and 21,280 horsepower in three new compressor stations; plus 158 miles of lateral pipelines in Louisiana and Texas.

Ohio Fuel Gas Storage Area Authorized

Ohio Fuel Gas Company has been authorized to convert five natural gas pools in Ohio to storage service and to construct about 35 miles of pipeline to permit delivery of approximately 50 MMcf per day into one of the new storage areas.

The Commission denied the company's proposal to convert one pool in Coshocton and Guernsey Counties into a new area to be called the Guernsey Storage Area. The FPC said that activation and operation of this storage area is dependent upon the receipt of natural gas from Tennessee Gas Transmission Company, and that a connection would be necessary in order for Ohio Fuel to receive gas from Tennessee. The Commission pointed out that Tennessee has not made application for authorization to establish such a connection.

In connection with the storage program, Ohio Fuel was authorized to build a 6,000 horsepower compressor station in the Holmes area and approximately 97 miles of pipeline to connect the storage areas with existing transmission facilities.

July-December Authorizations Add 1.25 Billion Capacity

Construction of natural gas transmission facilities designed to add more than 1¼ billion cubic feet of daily delivery capacity to individual pipeline systems was authorized by the Commission during the last six months of 1952.

The new facilities involve 2,232 miles of natural gas pipeline and have a total estimated construction cost of $174,055,234.

Approximately $164,293,258 of the total construction cost was for major projects, each estimated to cost $700,000 or more. These major projects are expected to benefit 78 cities of 50,000 population or more, in seventeen states.

The largest single authorization during the six-month period was for Texas Gas Transmission Corporation to construct and operate 408 miles of 26-inch loop line in segments on its main line system between Louisiana and Kentucky and 26,860 horsepower in new and existing main line compressor stations in Louisiana, Tennessee,

(Continued on page 26)

Natural Gas Reserves Up 3%—Production Up 8.4%

PROVED recoverable natural gas reserves in the United States on December 31, 1952, totaled 199.7 trillion cubic feet, an increase of 5.9 trillion cubic feet over reserves of 193.8 trillion cubic feet a year earlier, according to a joint report of the committee on reserves of American Gas Association and American Petroleum Institute. These reserves achieved a new record high level together with an all-time high in production, 8.6 trillion cubic feet in 1952. The previous record production was 8.0 trillion cubic feet in 1951.

The AGA committee on natural gas reserves estimated proved recoverable reserves of natural gas liquids on December 31, 1952, were up to a record level, almost 5.0 billion barrels. The previous high of 4.72 billion barrels was at the end of 1951. This increase was registered despite a record production of 285 million barrels of liquids last year.

The discovery of 5.4 trillion cubic feet of new reserves in 1952 compared with 3.0 trillion of reserves in new fields brought in during 1951, emphasized the importance of exploration activities to meet the increasing demand.

Further exploration and drilling in existing fields added 8.9 trillion cubic feet to the reserves. Nearly 199 billion cubic feet of natural gas were added to estimated reserves in underground storage at the end of 1952.

Last year, the margin of total reserves expansion over the concurrent production was significantly narrower than the comparable 1951 margin.

New natural gas reserves discovered in 1952, plus the extensions and revisions of the 1951-estimate, totaled 14,345 billion cubic feet. That expansion exceeded the total production by 40 per cent.

In 1951, the reserves expansion—newly discovered reserves, plus extensions and revisions of the 1950-estimate—showed a margin of 50 per cent over the total production.

The 199.7 trillion cubic feet of recoverable natural gas reserves in 1952 registers a 3 per cent increase over the reserves estimate of 193.8 trillion cubic feet a year earlier. The latest production total of 8.6 trillion cubic feet for natural gas is 8.4 per cent higher than the 1951-total of 8.0 trillion cubic feet.

The AGA-API committee on natural gas reserves included: N. C. McGowen *(chairman)*, United Gas Corp.; R. M. Bauer, Southern California Gas Co.; E. A. Brown, Lone Star Gas Co.; R. O. Garrett, Arkansas Louisiana Gas Co.; C. C. Hoffman, Cities Service Gas Co.; F. S. Lott, Petroleum Administration for Defense; L. H. Meltzer, Union Producing Co.; E. D. Pressler, Humble Oil and Refining Co.; E. E. Roth, Columbia Gas System Service Corp.; James Royds, Continental Oil Co.; J. T. Scopes, Union Producing Co.; H. N. Toler, Southern Natural Gas Co.; C. E. Turner, Phillips Petroleum Co.; O. E. Zwanzig *(secretary)*, AGA.

STATISTICS FROM AMERICAN GAS ASSOCIATION REPORT ON NATURAL GAS RESERVES

SUMMARY

Natural Gas Reserves and Production

	Dec. 31, 1952	Dec. 31, 1951	1952-1951
	(000,000 cubic feet)		
RESERVES, NATURAL GAS	199,716,225	193,811,500	5,904,725
	1952	1951	1952-1951
PRODUCTION,* NATURAL GAS	8,639,638	7,966,941	672,697

Natural Gas Liquids Reserves and Production

	Dec. 31, 1952	Dec. 31, 1951	1952-1951
	(000 bbl, 42 gallons)		
RESERVES, NATURAL GAS LIQUIDS	4,996,651	4,724,602	+272,049
	1952 (Year)	1951 (Year)	1952-1951
PRODUCTION, NATURAL GAS LIQUIDS	284,789	267,052	+17,737

Natural Gas Reserves

(000,000 cubic feet)

Total proved reserves, December 31, 1951		193,811,500
Extensions and revisions of previous estimate	8,934,470	
New reserves discovered in 1952	5,411,043	
Net changes in "stored gas" during 1952	198,850	
Total proved reserves added and net changes in "stored gas" during 1952		14,544,363
Total proved reserves, December 31, 1951, and additions during 1952		208,355,863
Deduct production* during 1952		8,639,638
TOTAL PROVED RESERVES, DECEMBER 31, 1952		199,716,225

Natural Gas Liquids Reserves

(000 bbl, 42 U. S. gallons)

Total proved reserves, December 31, 1951		4,724,602
Extensions and revisions of previous estimate	475,170	
New reserves discovered in 1952	81,668	
Total proved reserves added in 1952		556,838
Total proved reserves, December 31, 1951, and new proved reserves added in 1952		5,281,440
Deduct production during 1952		284,789
TOTAL PROVED RESERVES, DECEMBER 31, 1952		4,996,651

* 1952 figures are net after deducting gas returned to reservoirs for cycling and pressure maintenance.

Bacterial Attack on Buried Piping Regarded As Serious Cause of Rapid Corrosion

by Carl G. Deuber, Ph.D.
Director
Deuber Laboratories

PART 2—The first part of Dr. Deuber's description appeared in the February issue of American Gas Journal.

DETECTION of bacterial corrosion may proceed along three lines: (1) the isolation and identification of the causative microorganisms; (2) from inspection of the characteristic corrosion products; and (3) by the correlation of distinctive soil factors with the occurrence and probably state of activity of the sulfate-reducing bacteria. There are practical reasons why the choice of diagnostic methods may be restricted and not always readily available to the corrosion engineer. For example, the isolation of the bacteria is a time-consuming laboratory procedure for the trained bacteriologist and it is not suited to soil survey work.

Pipe inspection, to note the characteristic corrosion products resulting from bacterial activity, is in the province of the corrosion engineer. These corrosion products always contain sulfides which can be recognized by placing some of the products in a test tube and adding a few drops of weak hydrochloric acid. The unforgettable odor of hydrogen sulfide is evolved when sulfides are present. This test of course recognizes the damage after it has been done and is not applicable for survey work in soils in which reference corroding iron is lacking.

Correlation of physical or chemical soil factors constantly associated with bacterial corrosion or potential corrosion due to bacterial action holds most promise. This was a major objective of an American Gas Association Iron Corrosion Fellowship in 1941-45. The soil factors singled out for special study were the acidity of the soil, usually expressed as pH, and the reducing capacity of the soil measured as the redox potential or E_h. The sulfate-reducing bacteria thrive in neutral or near-neutral soils and in the absence of free oxygen or very low partial pressures of this gas.

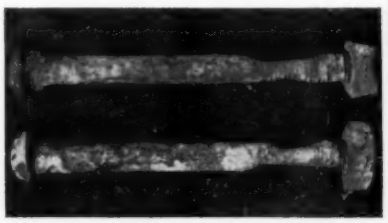
Soil probe has been devised

In this project, an experimental soil probe was devised, capable of measuring pH and E_h values of soils in place and at pipe depth. The instrument was satisfactory in very wet soils and the data reported correlated with those secured by pipe inspection. A scale was prepared of ranges of E_h values classifying soils as severely, moderately or slightly corrosive and also non-corrosive so far as the redox potential data applied. Additional development work, however, is indicated to make this instrument generally useful for soil survey work.

Detection of the presence of sulfate-reducing bacteria by laboratory methods is not so complex in water pipelines, condenser tube water and the water seals of gas holders as it is in soil. Casing corrosion in oil wells also belongs in this category. In water service lines the sulfate-reducing bacteria have been isolated from within the tubercles formed by iron bacteria and there is evidence to show that pitting of the interior of the pipe results from this association.

Remedial measures for bacterial corrosion of soil-buried iron fixtures are largely lacking. Emphasis must be placed on preventive measures. This in turn emphasizes the requirement for reliable diagnostic methods to estimate the potential capacity of soil sites for bacterial corrosiveness.

The requisite environmental conditions for severe bacterial corrosion may prevail over a considerable area as in a swamp, bog or mud flat. But frequently these conditions are localized and widely scattered. Heavy clay soils, poorly drained and poorly aerated are always to be suspected. The reaction favorable to the sulfate-reducing bacteria is the range at or near neutrality. The presence of organic matter, such as residues of vegetation and decaying roots, is a source of food which stimulates multiplication of the bacterial population.



Bolts from a coupling on a gas pipe line in Metropolitan New York. Sulfate-reducing bacteria were present in the corrosion products and in the soil.

Ferrous metal attracts bacteria

Some investigative work indicates that the presence of ferrous metal in the

(Continued on page 40)

CORROSION ASSOCIATED WITH BACTERIAL ATTACK

This pipe sample, removed from bacteria-bearing soil, shows the extent of corrosion after attack by sulfate-reducing bacteria.

Corrosion products that are high in iron sulfide suggest that it might have its origin from bacteria that produce hydrogen sulfate.

HERE'S HOW TO GIVE UNINTERRUPTED SERVICE SAFELY WITH MUELLER NO-BLO LINE STOPPER EQUIPMENT

WHEN IT IS NECESSARY TO REPAIR OR REPLACE A SECTION OF DISTRIBUTION PIPE OR ADD LINES UNDER PRESSURE, CONSIDER THIS TYPICAL PROBLEM AND ITS SIMPLE SOLUTION.

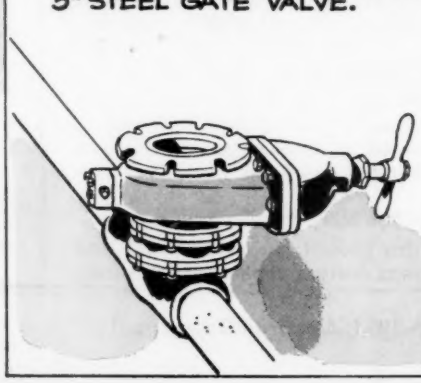
Maintain pressure and flow in the two 3" elements and one 2" element while the new connections are made.

Abandon 2" leaking lateral.

Remove leaking threaded cross; replace it with an all-welded tie-in.

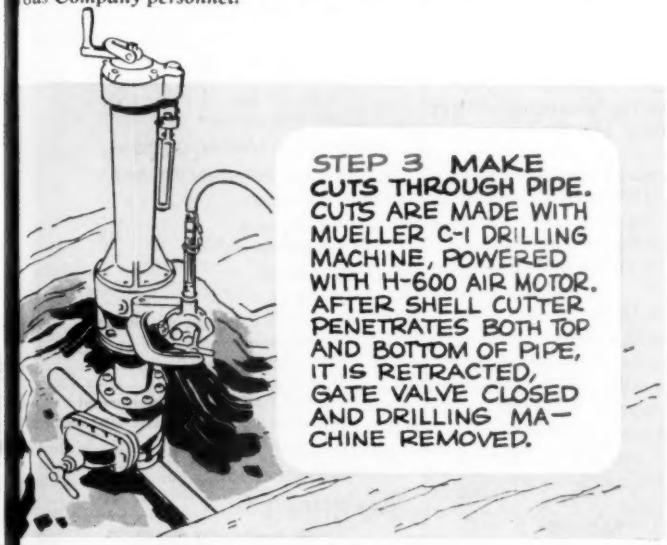
STEP 1 WELD FITTINGS ONTO LINE. AREAS OF PIPES TO BE WELDED ARE THOROUGHLY CLEANED. TWO HALVES OF WELDING FITTING ARE TACK WELDED TOGETHER AROUND PIPE, POSITIONED AND WELDED TO PIPE.

STEP 2 BOLT ADAPTER AND GATE VALVE TO FITTING. 3" FLANGED LINE STOPPER FITTINGS ARE EQUIPPED WITH FLANGED ADAPTER AND 5" STEEL GATE VALVE.



EER NO-BLO Method

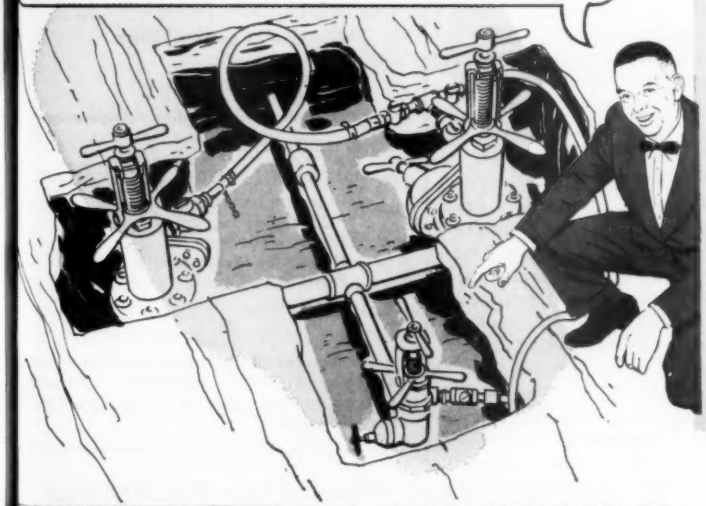
his is the first of a series of gas distribution problems and their step-step solution by Frank Miller, Gas Engineer of Mueller Co. Mr. iller, narrator of the Mueller Traveling No-Blo Exhibit, is currently ring the country explaining the application of No-Blo equipment Gas Company personnel.

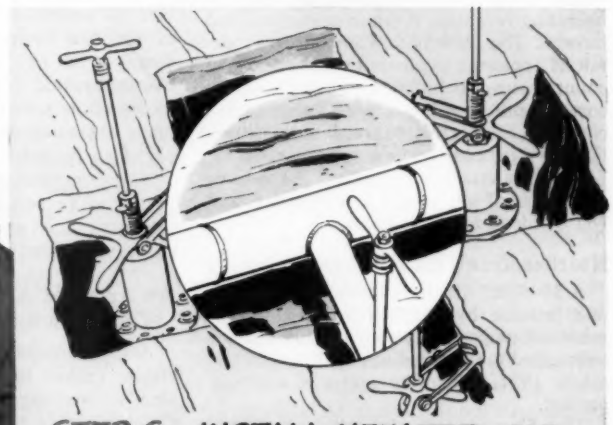


STEP 3 MAKE CUTS THROUGH PIPE. CUTS ARE MADE WITH MUELLER C-1 DRILLING MACHINE, POWERED WITH H-600 AIR MOTOR. AFTER SHELL CUTTER PENETRATES BOTH TOP AND BOTTOM OF PIPE, IT IS RETRACTED, GATE VALVE CLOSED AND DRILLING MACHINE REMOVED.

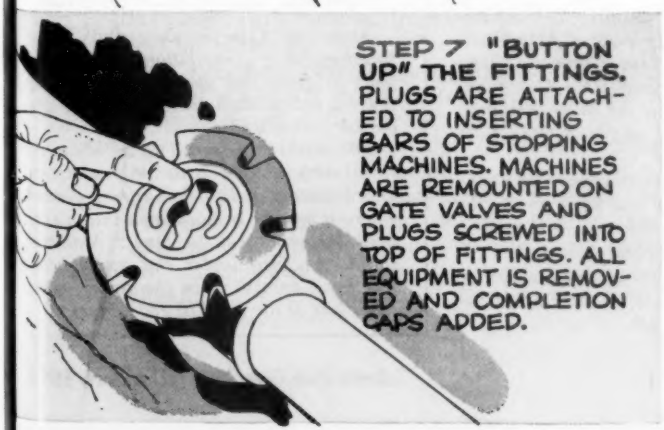
STEP 4 ATTACH STOPPING MACHINES AND BY-PASS CONNECTIONS. BY-PASS RUBBER STOPPERS ARE ATTACHED TO INSERTING BARS, AND STOPPING MACHINES BOLTED TO GATE VALVES. BY-PASS LINES ARE CONNECTED.

STEP 5 ISOLATE CROSS. STOPPERS ARE LOWERED AND EXPANDED, ISOLATING CROSS, BUT FLOW OF GAS CONTINUES THROUGH BY-PASS LINES AND MAINTAINS PRESSURE.

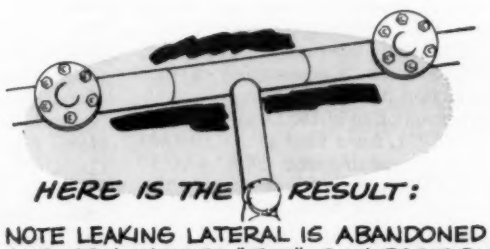




STEP 6 INSTALL NEW TEE. OLD CROSS CUT OUT, ONE LINE ABANDONED AND NEW TEE WELDED IN PLACE. STOPPERS ARE RAISED, GATE VALVES CLOSED AND STOPPING MACHINES REMOVED.



STEP 7 "BUTTON UP" THE FITTINGS. PLUGS ARE ATTACHED TO INSERTING BARS OF STOPPING MACHINES. MACHINES ARE REMOUNTED ON GATE VALVES AND PLUGS SCREWED INTO TOP OF FITTINGS. ALL EQUIPMENT IS REMOVED AND COMPLETION CAPS ADDED.



HERE IS THE RESULT:

NOTE LEAKING LATERAL IS ABANDONED AND NEW WELDED "TEE" IS IN POSITION. PROVISION IS MADE FOR FUTURE ADDITIONS OR REPAIRS.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

Federal Power Commission

(Continued from page 21)

Indiana and Kentucky. This project is estimated to cost $33,752,705 and is designed to increase Texas Gas' delivery capacity by 295 MMcf per day.

Since February 7, 1942, the date when the certificate provisions of the Natural Gas Act became effective, the Commission has authorized construction and operation of a total of nearly 48,000 miles of pipelines and more than 3,400,000 horsepower in compressor units at a total estimated cost of more than $3,337,000,000. The facilities authorized since 1942 are designed to carry more than 18 billion cubic feet daily.

Rules Amended, More Data Required

An order has been issued amending the Commission's rules by revising Form No. 11, Monthly Statement of Operating Revenue and Income Covering Natural Gas Companies, to call for additional information from the reporting companies.

The revised form, which became effective early in February, is to be used for monthly statements commencing with January of 1953. The forms are to be filed by the last day of the month following the one covered by the statement.

Form No. 11, as revised, is designed to obtain monthly information concerning gas operating revenues, revenue deductions and income. The information includes (1) detail of operating expenses by functional account groups, including a statement of the cost of purchased gas and volume purchased, (2) interest charged to construction, (3) gas construction work in progress, (4) gas materials and supplies, (5) volume and value of gas stored underground, and (6) dividend appropriations.

Northeastern's Rate Increase Allowed

A $749,000 annual wholesale natural gas rate increase by Northeastern Gas Transmission Company has been allowed and has terminated the proceedings instituted in October, 1951, when the increase was suspended.

The Commission also allowed Northeastern to retain all of the funds collected under bond since April 1, 1952, when the increase went into effect subject to refund of any amounts subsequently disallowed by FPC.

Power Plants Used More Gas in 1952

Consumption of gas by electric utility power plants during 1952 was up 19.4 per cent over 1951, reaching a record of 911,866.6 MMcf, the Commission reports in its monthly series on "Consumption of Fuel for Production of Electric Energy."

Coal consumption in 1952 was up 1.2 per cent from 1951, for a total of 107,039,868 tons. Fuel oil requirements of 67,119,517 barrels in 1952 were 5 per cent above 1951.

Iroquois Applies for Storage Approval

Iroquois Gas Corporation, Buffalo, N. Y., has applied to the Commission for authority to construct pipeline facilities in connection with the development of the Aurora Field near Aurora, N. Y., as a storage area for natural gas.

The company plans to develop the field to an estimated capacity of approximately 1.6 billion cubic feet, and to construct about 6 miles of 16-inch pipeline to connect the storage area with its system. Total estimated cost of the proposed project is $800,000.

Iroquois said that it needs to develop the additional storage simply to achieve reasonable operating flexibility. The company also pointed to its prospects for normal growth, its backlog of applications for space heating, and its prospects for obtaining additional supplies of natural gas from time to time.

The company proposes to begin construction as early in 1953 as the weather permits, so that the field can be used to some degree during the 1953-54 winter, and to complete the project by the end of 1954.

Panhandle Seeks to Drop Deliveries to Texas Gas

A Commission hearing will commence April 6 on an application by Panhandle Eastern Pipe Line Company requesting approval of the abandonment, commencing next September 1, of natural gas service to Texas Gas Transmission Corporation under a 1938 contract.

Under the contract, Panhandle is obligated to deliver 18 MMcf per day to Texas Gas at connections between the systems of the two companies. Panhandle claims that it is not necessary to continue the deliveries because Texas Gas has substantially increased its sources of gas supply and has made extensive enlargements of its transportation facilities.

The Commission, in a concurrent order, permitted Texas Gas, Indiana Gas & Water Company, Inc., and Terre Haute Gas Corporation to intervene in the proceeding.

An Array of Approvals for Columbia System

A Commission examiner has filed a decision, subject to review by the Commission, authorizing eight subsidiaries of The Columbia Gas System, Inc., to carry out natural gas pipeline construction projects.

The decision, at the same time, denied applications by two other companies which were seeking supplies of natural gas from Columbia System subsidiaries. The decision involves rulings on a total of 13 applications by the 10 companies.

The applications which were granted were filed by Atlantic Seaboard Corporation, Virginia Gas Transmission Corporation, Central Kentucky Natural Gas Company, United Fuel Gas Company, The Manufacturers Light and Heat Company, Natural Gas Company of West Virginia, Home Gas Company, and The Ohio Fuel Gas Company.

The decision denies applications by Shenandoah Gas Company and Rockland Light and Power Company, which had requested FPC to order Columbia subsidiaries to supply them with natural gas, and authority to construct proposed new pipeline facilities to transport this gas.

American Gas Fundamentals

OUTLINE

NATURAL GAS
- *Geology
- *Drilling and completion
- *Methods of estimating reserves
- *Chemicals from gas

MANUFACTURED GASES
- *Coke oven gas; producer gas, blue gas; carbureted water gas
- *Reformed gas
- *Hi-Btu oil gas
- Interchangeability

LIQUEFIED PETROLEUM GASES
- *Sources, properties and uses

BASIC GAS LAWS
- *Perfect gases
- Supercompressibility

TRANSMISSION
- *Pipe lines
- *Corrosion and pipe protection
- *Compressor stations
- *Gas conditioning
- Flow formulae
- *Principles of orifice measurement
- Pipe coatings and protection methods

GAS STORAGE
- *Methods of storing gas

GAS DISTRIBUTION
- *System design and operation
- *Pressure regulation, part 1
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- *Metering
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GAS UTILIZATION
- *Principles of gas combustion
- Domestic
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CONVERSION PRACTICES

MANAGEMENT PROBLEMS AND POLICIES
- *Corporate structure
- *Public utility regulation
- *Public relations
- Theories of rate making
- Rights-of-way

GLOSSARY

***Indicates chapters published since January 1, 1951; available without charge to new subscribers to American Gas Journal.**

How to Use the Material

American Gas Fundamentals *is a comprehensive compilation of basic gas facts to guide any gas utility employee toward a broader understanding of the industry as a whole.*

The series is designed to be removed from each current issue of American Gas Journal *and filed in a ring binder where it may be accumulated into a text book of permanent usefulness. Material should be filed under the major subject head appearing in the upper right hand box at the head of each chapter.*

Glossary of Gas Industry Terms: Ab to Car

A

ABSOLUTE PRESSURE Gauge pressure plus atmospheric pressure.

ABSOLUTE ZERO Absolute zero is the temperature at which a gas would show no pressure if the general law for gases should hold for all temperatures. It is equal to—273.18° C. or—459.72° F.

ABSORBENT OIL Liquid used to dissolve vaporized components from a gas.

ABSORPTION The extraction, from an atmosphere or mixture of gases or liquids, of one or more fluids, by the substance of a porous material with which the atmosphere, gases or liquids come in contact. The absorption or extraction process causes or is accompanied by a physical or chemical change, or both, in the sorbent material. See and note difference in Adsorption.

ABSORPTION REFRIGERATION SYSTEM System in which refrigerant vapors, after passing through cooling coils, are absorbed in a second liquid and then released by application of heat. The refrigerant vapor from the absorbent is then condensed to a liquid and returned to the cooling coil to evaporate and thereby remove heat from cooling coil.

ACCELERATION The rate of change in velocity, usually expressed in terms of distance, per unit of time, and often accompanied by unit of volume.

ACCIDENT FREQUENCY RATE Number of injuries, including disabilities and fatalities, per million man-hours worked, and occurring during employment. Each disability counted results in at least one day's loss-of-time.

ACCIDENT SEVERITY RATE Number of days lost due to disabling injuries, per thousand man-hours worked. Appropriate time charges are made for permanent disability and fatality.

ACTIFIER Equipment used to remove an absorbed material from absorption oil, thereby enabling reuse of the absorption oil.

ACTIVATED CARBON Carbon of vegetable origin with high adsorptive capacity, used as the medium in air and gas Filters.

ADIABATIC A term that describes a process in which no heat is added to or taken from a material that is being subjected to the process.

ADSORPTION The extraction, from an atmosphere or mixture of gases or liquids, of one or more fluids, by surface adhesion to the material with which the atmosphere, gases or liquids come in contact. The adsorption or extraction process does not cause and is not accompanied by either a physical or chemical change in the sorbent material. See and note difference in Absorption.

AFTER-COOLER Heat exchanger used to cool gas after it has been compressed.

AFTER-COOLING The process of cooling compressed air or gas, as that may be required, immediately after compression.

AFTER-CRACKING Process in which gas is further decomposed after distillation from coal, generally accompanied by the production of ammonia.

AGA Abbreviation of American Gas Association.

AIR A mixture of nitrogen, oxygen, water vapor, carbon dioxide, argon, neon and small quantities of other rare gases. For all practical purposes of combustion, air may be said to be composed, by volume, of Oxygen (O_2)—20.9%, Nitrogen (N_2)—79.1%; and, by weight, of Oxygen (O_2)—23.15%, Nitrogen (N_2)—76.85%. Weight of air at 60° F is .076 lb. per cubic foot at sea level, atmospheric pressure. One pound of air at 60° F and at atmospheric pressure has a volume of 13.06 cubic feet.

AIR BLAST Air, under pressure, blown into a furnace or other equipment.

AIR COMPRESSOR See Compressor.

AIR CONDITIONING The process of heating, cooling, humidifying, drying or otherwise treating air in a room or building to maintain a specified temperature and relative humidity.

AIR COOLED CONDENSER A piece of equipment for condensing and cooling a vapor by means of a current of air passed over the equipment. See Condenser.

AIR, DRY A psychrometric consideration, air that does not contain and is not mixed with any water vapor.

AIR-GAS RATIO The ratio of the air supply to the gas supply, necessary to achieve a desired character of combustion.

AIR INTAKE The volume of air entering a piece of equipment. Also, the opening through which air is admitted to the equipment.

AIR PORT See Air intake.

AIR PURGE Cleaning or removal of objectionable materials from equipment by means of an air blast. Also, one step in the cyclic process of making blue or water gas.

AIR, SATURATED A mixture of dry air with its maximum capacity for water vapor.

AIR SHUTTER An adjustable plate, flap, or louvre or set of them, mounted over an air port to control the flow of air through the port.

AISI Abbreviation of American Iron and Steel Institute that appears together with system of numbers for common and alloy steels.

AMBIENT TEMPERATURE The temperature of the air, atmosphere or other fluid that completely surrounds the apparatus, equipment or the work-piece under consideration.

GLOSSARY

AMMONIA A gaseous compound, NH_3, readily absorbed by water, derived from, among other sources, manufactured and natural gas.

AMMONIA LIQUOR Solution of ammonia in water, as it is obtained in recovery of ammonia from coal gas. Sometimes called ammoniacal liquor.

AMMONIA STILL Equipment used to distill pure ammonia vapor from ammonia liquor.

AMMONIA WASHER Equipment used to wash ammonia vapor out of coal gas. A mechanical means of mixing the coal gas and water so that ammonia can readily dissolve in the water.

ANNEALING A process involving heating and cooling applied usually to induce softening of metals. The term also is used to cover treatments intended to remove stresses, alter mechanical or physical properties, produce a definite microstructure, and remove gases.

ANNEALING, BRIGHT A process which is usually carried out in a controlled furnace atmosphere so that metal surface oxidation is reduced to a minimum and the surface remains relatively bright.

ANODE Positive pole in an electrolytic system, such as applied in cathodic protection; the electrode at which oxidation or corrosion occurs. See also Cathode and Cathodic protection.

ANODIC COATING Protection of a metal by providing for preferential chemical attack through the formation of an electrochemical couple. A coating of zinc on steel is typical.

ANTICLINE Also called dome, the upward geological fold in rocks that is important for possible accumulations of oil and gas.

API Abbreviation of American Petroleum Institute, used with numerical designations of oil densities.

APPLIANCE REGULATOR A device for automatic control of some phase of operation of a gas appliance or other gas equipment.

ASA Abbreviation of American Standards Association.

ASBESTOS A fibrous mineral that is heat- and fire-resisting; used in the form of paper, cloth and mortar mixtures for insulation.

ASH PIT The space below the fire bed grate of a furnace or boiler into which ashes from a solid-fuel fire drop.

ASHVE Abbreviation of American Society of Heating and Ventilating Engineers.

ASM Abbreviation of American Society for Metals.

ASPHALT BASE OIL Oil, which leaves an asphalt-like residue when distilled.

ASME Abbreviation of American Society of Mechanical Engineers.

ASSOCIATED NATURAL GAS Natural gas that is free, in immediate contact, but not in solution with crude oil in reservoirs.

ASTM Abbreviation of American Society for Testing Materials.

ATMOSPHERE Mixture of gases comprising air. Also, mixture of gases within any specified chamber such as in a furnace combustion chamber. Also, a unit of pressure equal to 14.696 pounds per square inch at sea-level.

ATMOSPHERE, NEUTRAL In a furnace or heating operation, neither oxidizing nor reducing, and indicates a state of perfect combustion. For a given high-temperature heating furnace this type of atmosphere is usually the ideal and represents maximum fuel economy in combustion.

ATMOSPHERE, OXIDIZING In a furnace or heating operation, an atmosphere in which there is an excess of oxygen or air present. Sometimes it is desired to have such an atmosphere to aid certain chemical reactions. In most cases of furnace heating this type of atmosphere results in waste of fuel and scaling of the work. Also, in some cases, an oxidizing atmosphere exists because it has been necessary to reduce the flame temperature by dilution with cold air for low temperature operations.

ATMOSPHERE, REDUCING In a furnace or heating operation, an atmosphere in which there is a deficiency of oxygen or air to complete the process of combustion. Such an atmosphere is deliberately produced in some operations to aid certain chemical reactions or to preclude scaling or oxidizing of the work. In most cases of furnace heating excessive reducing atmosphere causes a waste of unconsumed fuel and a lowering of furnace temperature.

ATMOSPHERIC PRESSURE The pressure of the weight of air and water vapor on the surface of the earth. Approximately 14.7 pounds per square inch at sea level.

ATMOSPHERIC REGULATOR A gas regulator of the diaphragm-type that maintains atmospheric or Zero pressure. Also called Zero governor.

ATOM The smallest unit quantity of an element that is capable of chemical combination.

AUTOMATIC CONTROL Mechanical system by which the conditions of a process or operation are maintained at specified values and times without direct dependence upon a human operator.

AUTOMATIC SAFETY PILOT A small burner for igniting the main burner of gas-burning equipment, connected so that if the flame of the pilot burner is extinguished for any cause, the gas supply to the main burner is automatically shut off.

AUTOMATIC SHUT-OFF VALVE A valve that automatically shuts off flow when a specific, predetermined condition or time is attained.

AUXILIARY REGULATORS Small controls used in addition to, or to assist, larger main controls.

AVAILABLE HEAT The heat available for useful purposes, arrived at, in general, by subtracting dry flue gas and moisture losses from the gross heat released into a combustion chamber.

B

BACK-FILL Earth which has been replaced in a ditch or trench after pipe or other device has been installed.

BACK-FIRE An explosion that takes place when too much primary air is mixed with gas, forming an explosive mixture which, igniting from the burner, burns in the mixing chamber.

BACK-PRESSURE Pressure against which a fluid is flowing. May be compounded of friction in lines, restrictions in pipes, valves, pressure in vessel to which fluid is flowing, hydrostatic head, or other impedient which causes resistance to fluid flow.

BACK-PRESSURE VALVE A valve so constructed that fluid will flow in one direction only and if back pressure becomes sufficient to reverse fluid flow, valve will close. Also called a check valve.

BACK RUN A stage of a cyclic process in which flow of the fluid is reversed through the equipment.

BAFFLES Plates, louvres or screens placed in the path of fluid flow so as to cause change in the direction of flow; used to promote mixing or to knock out undesirable solid or liquid particles in the fluid stream.

BAILER Used in Cable tool drilling, a simple tube suspended on a cable with a foot-valve at the bottom and open at the top. The foot-valve opens when the bailer touches the bottom of the drilled hole, permitting water with drill-cuttings in suspension to enter the tube. When the bailer is raised to be emptied, the foot-valve closes instantly as it loses contact with the bottom of the hole and retains the water and drill-cuttings.

BALANCE GOVERNOR A type of governor in which the moving parts of the mechanism are counter-balanced by adjustable weights.

BAND WHEEL Part of Cable tool drilling equipment, a large wheel turned by a belt that is connected with the drive engine and fitted with a crank-like arrangement on one side that, progressively, results in the rising and falling action of the cable from which the Drill bit is suspended.

BAR HOLE Hole made in ground along route of gas pipe when barring for leaks.

BAROMETER An instrument that measures atmospheric pressure in terms of inches, centimeters or millimeters of mercury column.

BAROMETRIC PRESSURE The pressure of the atmosphere as determined by a barometer. See Atmospheric pressure.

BARREL, OIL 42 U. S. gallons.

BASE PRESSURE The pressure used as a standard in determining gas volumes. Volumes are measured at operating pressures and then corrected to base pressure volume.

BASE PRESSURE INDEX A conversion factor used to correct gas volume at operating pressure to volume at base pressure without regard for any correction for temperature.

BASE VOLUME INDEX A conversion factor to correct gas volumes, measured at operating temperature and pressure, to volume at base temperature and pressure.

BATCH-TYPE FURNACE An industrial furnace in which material is heated or processed in batches. For comparison, see Continuous-type furnace.

BATTERY OF COKE OVENS A group of coke ovens arranged in a line, side by side.

BELL-AND-SPIGOT PIPE Pipe made with a cup like flare at one end (the bell) and a rolled bead at the other end (the spigot). The spigot is set into the bell and the joint packed with caulking and lead to seal it.

BELL HOLE An enlarged hole dug in a trench to allow room for workmen to make a joint in pipe, such as caulking bell and spigot pipe or welding steel pipe.

BENZENE (benzol) An aromatic hydrocarbon found in manufactured gas and coal tar.

BI-METALLIC STRIP Two joined parallel strips of different metals. Due to their different coefficients of thermal expansion, variations in temperature will cause the dual-strip to bend. This mechanical action is used to indicate temperature, close or open electric contacts at specific temperatures for control purposes.

BLACK BODY A material, not necessarily black in color, that would theoretically absorb all radiant energy directed to it.

BLACK BODY RADIATION The theoretical rate at which there is radiation from a black body at given temperatures.

BLACK STEEL PIPE Ordinary steel pipe.

BLANK FLANGE A round steel plate bolted to the end of flanged pipe to seal the end of pipe.

BLAST See Air blast.

BLAST BURNER A burner in which compressed air or a mixture of air and gas is supplied for combustion.

BLAST HEATER A device made up principally of heat transfer surfaces that heats air forced into contact by a blower or fan.

BLAST MAIN Pipe connecting blower or compressor to burner or furnace and through which blast air is delivered.

BLAST PERIOD Time during which blast air is blowing through furnace.

BLAST PRESSURE Pressure at which blast air is blown.

BLAST VALVE Valve for controlling flow of blast air.

BLOW The preparation period in blue gas manufacture when air is being forced through the fuel bed.

BLOW HOLES Passages through fuel bed of a gas generating furnace caused by air blast.

BLOW OFF Relieving excessive pressure in a vessel.

BLOW PURGE A stage in the cycle of making water gas during which gas remaining in the equipment is purged or blown out at the start of the preparatory air blast.

BLOWER A device for forcing air or gas to flow in the desired direction and at greater volumes and higher pressures; it may be either fan, centrifugal or positive displacement.

BLUE FLAME Gas flame in which combustibles are completely consumed, leaving no luminous carbon particles to impart yellow or orange color.

BLUE GAS Also called water gas. Made in a cyclic process in which a fuel bed is alternately subjected to blast of air and steam.

BOILER A heat exchanger, usually heated by fuel flames and combustion gases, that raises water temperatures to the point of formation of steam.

BOILER COMPOUND A chemical used to treat the feed water of a boiler to eliminate or reduce the water-hardness which would cause scale inside the boiler.

BOILER EFFICIENCY The ratio of heat absorbed per unit of fuel fired in a boiler, to the heat available in the complete combustion of the same unit of fuel.

BOILER HORSEPOWER The heat required to convert 34.5 lb. of 212° F water, per hour, to steam at 212° F. This is the equivalent of a boiler output of 33,475 Btu per hour.

BOILER PRESSURE The steam pressure within a boiler, usually expressed in pounds per square inch gauge.

BOOSTER A blower or compressor used to raise pressure or increase flow in a gas or air pipeline.

BOTTLED GAS Liquefied petroleum gas contained under high pressure in cylinders, for convenience in delivering to customers.

BOURDON TUBE An arc-shaped or spiraled metal tube that is elliptical in cross-section and has one end attached to a pressure-indicating, -controlling, or -recording device. Pressure changes inside the tube effect its elliptical shape and actuate the device to which it is attached.

GLOSSARY

BRAZING The process of joining two pieces of metal by melting a metal that has a lower melting point than either of the pieces to be joined and which will adhere to both pieces, usually with the aid of a flux.

BREEZE Fine particles of coke or ash.

BTU One British thermal unit, or Btu, is 1/180 of the heat required to raise the temperature of one pound of water from 32° to 212° F, a rise of 180° F. A common nontechnical definition is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

BTU PER CUBIC FOOT A measure of the heat available or released when one cubic foot of a gas is burned.

BUBBLE SCRUBBER, WASHER A type of equipment in which a gas is washed by bubbling the gas in fine bubbles through the liquid.

BULK PLANTS, FOR LP GAS Permanently-installed pressure tanks and required accessory equipment for storing large volumes of LP gas and, in dealer's plants, withdrawing it for refilling bottles; in consumers' plants, withdrawing it for vaporization and utilization.

BUNKER C OIL A classification of heavy residual fuel oil derived as a product of distillation of crude oil.

BUNSEN BURNER A gas burner in which primary air enters a tube through an adjustable opening and is entrained by the gas jet discharged from an orifice. The air-gas mixture burns intensely at the end of the tube with a short flame.

BURNER A device for mixing air and fuel and burning the resulting mixture.

BURNER BLOCK A refractory block that may take a variety of forms, in which a gas burner assembly is mounted. A number of blocks may be clustered or arranged in any desired pattern and manifolded to the gas piping system.

BURNER CAPACITY Also burner rating, the maximum Btu per hour that can be released by a burner while burning with a stable flame.

BURNER, GAS Any device that is designed to accommodate gas and air, or a mixture of the two, for the purpose of combustion.

BURNER HEAD The part of a burner at which combustion occurs.

BURNER ORIFICE The restricted opening or orifice through which gas flows to the air-gas mixing chamber of the burner.

BURNER PORT Perforations in burner head at which air-gas mixture discharges and burns.

BURNER TIP An attachment for a burner head which forms a burner port modified for a specific application.

BURNER, TUNNEL Combustion chamber set in a furnace wall and in which the air-gas mixture is completely burned before entering the furnace.

BUTANE A liquefied petroleum gas, obtained by processing natural gas as produced and, also, from a process in petroleum refining.

BUTTERFLY VALVE A throttling valve made up of a disc that rotates on an axis within the valve body, thereby varying the cross-section that is open to fluid passage.

BUTT-WELD A weld in which the two edges of metal do not over-lap but only meet and are then joined together by the weld metal.

BY-PASS A piping arrangement, with valve control, that carries gas, air or other fluid around, instead of through, an integral section of the complete piping system.

BY-PRODUCTS Materials obtained incidental to the production of the major product.

BY-PRODUCT COKE OVEN PLANT A plant primarily for production of coke in which the gas produced is of secondary importance and hence a by-product.

BY-PRODUCTS, RESIDUAL Secondary products with commercial value obtained from processing of raw materials used in gas production. The by-products may result directly, or indirectly, as the result of further processing of residues.

C

CABLE TOOL One of two principal methods of drilling for gas and oil; the other is rotary. Cable tool, the older method consists of raising and dropping a heavy drill bit, suspended from the end of a cable, so that it punches and pulverizes its way through the subsurface structures. Water in the hole keeps the cuttings in suspension for removal at intervals by bailing.

CALORIFIC VALUE Also called heat content, the amount of heat released by combustion expressed in calories or, usually, in Btu, for gas, per cubic foot.

CALORIMETER A laboratory instrument for determining the heating value of a fuel.

CAP A cup-shaped fitting placed on the end of a pipe to seal the pipe, usually threaded on the inside and screwed over end of pipe. Also, the act of placing a cap on a pipe. Also, to close off a gas or oil well.

CAPROCK The impervious geological structure that retains gas in a reservoir.

CARBON An element, C, that has the widest use of all elements and enters into all organic material. It is infusible and is chemically inactive at lower temperatures; at higher temperatures, it burns and absorbs oxygen.

CARBON BLACK Also called lamp black, a finely divided carbon produced by incomplete combustion of natural gas.

CARBON DEPOSITION The settling of carbon on such interior surfaces as in furnaces, coal gas equipment, coke ovens.

CARBON DIOXIDE A gas, CO_2, which indicates complete combustion of carbon; measured by analysis of flue gases.

CARBONIZATION Driving off volatile components of coal by the application of heat, leaving carbon behind.

CARBONIZING CHAMBER Interior of equipment used to carbonize coal, such as coke oven or coal gas retort.

CARBONIZING PERIOD The time required to carbonize coal in a coke oven or coal gas retort.

The Glossary of Gas Industry Terms, of which this is the first installment, will be continued at intervals and completed before the final chapter appears in the American Gas Fundamentals Series

News of the Gas Industry

1953 AGA CONVENTION HEADED BY R. W. OTTO

Robert W. Otto, president, Laclede Gas Co., St. Louis, Mo., has been appointed chairman of the general convention committee of American Gas Association by Frank C. Smith, president of AGA. The 35th annual convention of AGA will be held at St. Louis, October 26 to 28, 1953. Headquarters of the association, convention registration and as many of the meetings as possible, will be held in the Kiel Auditorium.

Industry executives who will assist Mr. Otto in supervising the financing, housing, arrangement of the general sessions programs and the scheduling of other convention events are: Eskil I. Bjork, president, The Peoples Gas Light and Coke Company; Lyle C. Harvey, president and general manager, Affiliated Gas Equipment, Inc.; J. T. Innis, vice-president, Northern Natural Gas Company; F. A. Lydecker, vice-president, Public Service Electric & Gas Co. (N. J.); and James S. Moulton, vice-president and executive engineer, Pacific Gas & Electric Co.

Also appointed to the general convention committee were: Arthur Stockstrom, president, Magic Chef, Inc.; Henry Tuttle, president, Michigan Consolidated Gas Co.; John A. Weiser, executive vice-president, The Newport Gas Light Co.; A. H. Weyland, president, Arkansas Louisiana Gas Co.; and J. Theodore Wolfe, executive vice-president, Consolidated Gas Electric Light and Power Co., Baltimore. Kurwin R. Boyes, AGA, is secretary.

Hotel reservations will be handled through a housing bureau operated under supervision of the general convention committee. Members are urged to send applications for reservations as soon as possible to Hotels Convention Bureau, American Gas Association, Room 405, 911 Locust Street, St. Louis 1, Mo.

NEW BIG PIPELINE SYSTEM IN WELL-PUBLICIZED RUMOR

An application to build a $300,000,000 natural gas pipeline system, believed to be the largest ever proposed, will come before Federal Power Commission, according to plans indicated by J. O. Mack, H. S. Mack and Al Kleinkauf, Gulf Coast oil operators.

The line is projected with a capacity of 900 MMcf daily and would serve St. Louis, Chicago, Detroit, Cleveland, Philadelphia and intervening points. It is said to be backed by "some of the biggest oil and gas producers in the Gulf Coast area."

"We have lined up the gas supplies; we have arranged for financing and we have marketing commitments in the cities to be served," Mr. J. O. Mack is quoted as having said.

The line would be built by Houston Texas Gas and Oil Co., chartered in Texas six months ago. Names of directors and financial arrangements will be announced in the FPC application.

The system would get about 450 MMcf per day in Texas and the same volume in Louisiana. The Texas and Louisiana lines would join north of Monroe, La., in two 30-inch lines. The new pipeline company has offices in New Orleans, Shreveport and Houston.

AGA-GAMA Essay Winners Named

Winners and awards of the exposition essay contest sponsored by American Gas Association and Gas Appliance Manufacturers Association in conjunction with the 1952 AGA convention at Atlantic City, were announced by Frank C. Smith, president, Houston Natural Gas Corp., and president of AGA. The winners, who had submitted papers on what they had seen and learned at the exposition of gas appliances and equipment staged by GAMA, received prizes donated by GAMA.

H. R. Zeamer, sales promotion manager, Philadelphia Gas Works Division, The United Gas Improvement Co., was awarded first prize, a $200 U. S. Defense Bond.

Second prize, a $100 U. S. Defense Bond, was won by H. W. Nicolson, general superintendent of distribution, gas department, Public Service Electric & Gas Co., Newark, N. J. Kenneth Fellows, secretary, Houston Natural Gas Corp., was awarded third prize, a $50 U. S. Defense Bond.

Merit awards of $25 U. S. Defense Bonds were presented to 12 contestants for excellent papers. This group of winners included Louis Brunell, The Greenwich Gas Co., Greenwich, Conn.; J. R. Delaney, The Cincinnati Gas & Electric Co.; H. F. Foley, The Peoples Gas Light & Coke Co., Chicago; Ray C. Hazlett, Minneapolis Gas Co.; Edwin B. Kindelan, Boston Consolidated Gas Co., and William J. Lukacik, Central Hudson Gas & Electric Corp., Newburgh, N. Y.

New AGA Venting Requirement

A prominent marking showing the type of vents to be used with vented recessed gas heaters must appear on all such heaters under a recent ruling according to the American Gas Association Laboratories. The ruling, adopted by the executive committee of AGA's approval requirements committee, becomes effective April 1, 1953. The new marking is a guide to the installer and regulatory authorities as to the type of vent (fluepipe) system that must be used with approved vented recessed heaters. Information on the type of vents to be used is also required to be included in the instructions supplied with each heater.

The marking is required to appear on the heater in a conspicuous position where it can be observed during the rough-in inspection. Where a manufacturer does not furnish the vent system with the heater, the unit must be marked for the type of "B" vent, or wall vent, or equivalent vent listed by a nationally recognized testing agency for recessed heaters.

List Speakers for M-WGA Convention

The Mid-West Gas Association will hold its forty-eighth annual convention at the Broadmoor Hotel in Colorado Springs, Colorado, on March 30-31 and April 1, 1953. A program of general, promotional, sales and operating subjects has been arranged for the meeting.

Among the speakers who will appear on the program are: Frank C. Smith, president of American Gas Association; Frank Henke and W. Johnson, Harper-Wyman Co.; J. J. Hedrick, president Natural Gas Pipeline of America; Alfred L. Dowden, Liberty Mutual Insurance Co.; Robert W. Hendee, president Colorado Interstate Gas Co.; Miss Julia Hunter, Lone Star Gas Co.; L. E. Clancy, Detroit Michigan Stove Co.; Gaylor B. Buck, vice president Public Service Co. of Colorado; Ernie Olson, K. K. Company; M. A. Ennis, National Committee LP Gas Promotion; James F. Donnelly, vice president Servel.

Gall is Research Dir of INGAA

Lawrence H. Gall has been named director of research of Independent Natural Gas Association of America. His primary duties in the newly-created research department will be the collection and analysis of factual and technical information pertinent to the natural gas industry and for the use of the association's members. Mr. Gall has been related to the association's activities for the past seven years.

Ohio Commission Sees More Action

The Public Utilities Commission of Ohio has made a public forecast of stepped up efforts to "improve service from all utilities and continued attempts to get more natural gas for Ohio" during this year.

Ray O. Martin, commission member, said that for the first time in its history, the Commission would ask the incoming Ohio legislature for a broad series of new laws and revisions to help the PUCO handle problems in every phase of utilities regulation. Mr. Martin said staff conferences on legislation are being held daily and that a full announcement of the proposed program would be made some time this month.

The Ohio Commission also contemplates further expansion of the engineering division and establishment of a new research bureau, which would conduct independent studies. These studies would include general economic problems and specific questions brought up by rate requests within Ohio.

Management Awards to 5 Gas Cos

Five gas companies have been awarded certificates of management excellence for the year 1952 by the American Institute of Management: El Paso Natural Gas Co., Lone Star Gas Co., Oklahoma Natural Gas Co., Pacific Lighting Corp., and Washington Gas Light Co.

Only 330 companies in the United States and Canada, of the 3,000 concerns whose methods were studied by the Institute, were found eligible to receive the designation.

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SURVEY

Milt Heath advises . . .
"Sign up NOW for your 1953 HEATH GAS LEAK LOCATION SURVEY"

We are in the early stages of setting up Spring and Summer survey schedules. As it is extremely important that the time of our trained consultants be plotted well in advance, we urge you to take prompt action. Heath Consultants with their long experience, specialized equipment and latest methods will make complete and accurate gas leak location surveys of your property this season. Heath locates leaks, classifies them as to size and importance and furnishes detailed reports so you reduce leakage to the minimum. Write us at once.

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AGA Purchasing Conference Next Month

The American Gas Association purchasing and stores conference will be held at the Schroeder Hotel, Milwaukee, April 13 to 15, 1953. Purchasing agents, storekeepers, and stores' accountants are planning to attend the three-day meeting.

John C. Sims, purchasing agent of The Brooklyn Union Gas Company, is chairman of AGA purchasing and stores committee and, with the committee, has arranged a program which includes material standardization, purchasing department operating manual, unusual applications of material handling equipment, standard packaging, and a round-table discussion of purchasing, stores and related accounting problems.

C. Warner McVicar, director of purchasing and traffic, Rockwell Manufacturing Co., will present "The Value of a Purchasing Manual to Purchasing and Management."

Two New Appointees on AGA Committee

Earle A. Clark, director of public relations, Northern Natural Gas Co., and Schuyler F. Baldwin, director of public relations, Rochester Gas & Electric Corp., have been appointed members of the public information committee of American Gas Association. Howard A. Praeger, manager of publicity and advertising department, The Brooklyn Union Gas Company, has rejoined the AGA committee after serving a tour of duty in the U. S. Army.

Industrial School will be in Detroit

The 1953 industrial gas school sponsored by the industrial and commercial gas section of American Gas Association will be held at the Sheraton-Cadillac Hotel, Detroit, May 4 to 8.

Once a year the industrial and commercial gas section through its sales training committee, of which W. D. Relyea is chairman this year, sponsors this school for newcomers to the gas industry and as a refresher course for more experienced industrial or commercial gas men.

PCGA Offices have Moved

The Pacific Coast Gas Association has moved to room 308 in the Spreckels Sugar Building, 2 Pine Street, San Francisco 11, California.

The Los Angeles office of PCGA also has moved, to room 470 in the Southern California Gas Company's new building at 830 S. Flower St. The Los Angeles mail address remains the same; Box 3249, Terminal Annex, Los Angeles, 54.

Koester heads NEGA Industrial Div

Herman Koester, Jr., has been named chairman of the industrial division of the New England Gas Association for 1953. Mr. Koester, vice president of W. Wirt Young and Associates, Wellesley Hills, Mass., as chairman of the industrial division, will also be a member of the board of directors of New England Gas Association.

Robinson on AGE Directors Board

The election of J French Robinson to the board of directors of Affiliated Gas Equipment, Inc., has been announced by Lyle C. Harvey, president. Mr. Robinson became associated with Peoples Natural Gas Company in 1921 and rose to the company presidency in 1936.

J French Robinson

In 1951 he was elected president of Consolidated Natural Gas Company and chairman of the board of East Ohio Gas Company, New York, and, also, the chairman of the board of directors of East Ohio Gas Company, Cleveland.

Forbes is VP of NYS Natural

A. H. Forbes, former chief gas dispatcher for Consolidated Natural Gas, has been elected vice president of New York State Natural Gas Corporation. Mr. Forbes, who will move to Pittsburgh to assume his new duties, was associated with East Ohio Gas Company until January of this year. He began his term of service with East Ohio in 1936 and, in January 1953, was transferred to Clarksburg, W. Va., as chief dispatcher for the Consolidated System.

A. H. Forbes

Appointments made by Sprague

The appointment of Wilbur A. Ross as factory manager of the Sprague Meter Company has been announced. At the same time it was reported that Stanley J. Rauson has been promoted to the position of assistant factory manager.

Wilbur A. Ross

Stanley J. Rauson

Mr. Ross came to the company in 1937 as maintenance engineer and was promoted to plant engineer in 1947. As factory manager he will coordinate manufacturing, maintenance and personnel works at the plant.

Mr. Rauson, who has been plant methods and tool engineer, has been with Sprague Meter for over fifteen years serving as chief draftsman, then product development engineer.

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Two Elected to Servel Board

Rudolph Schnakenburg, vice president in charge of finance, and James F. Donnelly, vice president in charge of sales, Servel, Inc., were elected to the board of directors at the company's annual stockholders meeting.

The adoption, at the meeting, of a deferred payment profit-sharing plan for officers and other salaried employees was announced. Also adopted was a stock option plan providing for granting of options to key employees.

Members of the board of directors of Servel who were reelected are W. Paul Jones, president; Louis Ruthenburg, chairman; William V. Griffin, chairman, Brady Security and Realty Corp.; Richard C. Hunt, Chadbourne, Hunt, Jaeckel & Brown; Hunter S. Marston, chairman, Interstate Co. and Robert E. Walker, Kuhn Loeb & Co.

Ind. and Comm. Conference in April

The 1953 American Gas Association sales conference on industrial and commercial gas will be held on April 13, 14 and 15, in Philadelphia. The conference will be divided into separate sessions for industrial and commercial gas subjects with a day in between for a general session.

No committee meetings are to be held during the sessions at this conference. Committee meetings on the commercial phases probably will be held the day before the conference opens; committees covering subjects relating to industrial gas will meet the day after.

The program committee has arranged to have all papers presented within an allotted period leaving a specified time for discussion from the floor.

Orr & Sembower Appoints Ind Rep

The Young-Streeter Company has been appointed central and southern Indiana representative for Orr & Sembower, Inc. The company will handle sales and service of Powermaster automatic steam generators and hot water boilers.

Flotation Company is Organized

Organization of The Flotation Company, Inc., Elizabeth, N. J., has been announced by K. G. Hall, president. The new company has been approved as exclusive applicator of Aqua-Seal protective coatings to the submersible areas of water-sealed gas holders by the flotation process.

Flotation painting of water-sealed gas holders is accomplished by the floating of a special formulation paint upon the water of the seal of a lift. Lowering and then raising the lift causes the automatic impregnation, due to the hydraulic pressure of the tank water, of all surface areas regardless of condition, and results in a completely uniform distribution of paint. This, together with the unusually heavy wet film thickness applied, provides a protection of great durability as well as good appearance. Experience indicates that effective protection is provided for 2½ to 3 times the life of traditional methods.

Sales and operations will be under the direction of E. R. English, vice-president and general manager.

Penn State's Dean Steidle Retiring

Dr. Edward Steidle, dean of the school of mineral industries at Pennsylvania State College since 1928, will retire with emeritus rank on June 30.

His retirement was announced by president Milton S. Eisenhower, who also revealed that Dr. Elburt F. Osborn, associate dean of the school, will succeed Dean Steidle.

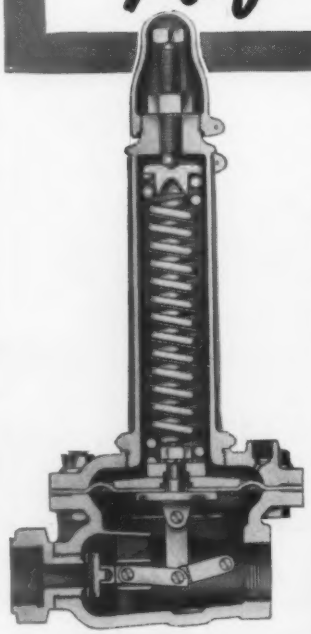
Dean Steidle is the author of more than 100 technical papers and of the books, "Mineral Industries Education," and "Mineral Forecast, 2000 A.D."

Dr. Osborn, named to the Penn State faculty in 1946 as professor of geochemistry, was named associate dean of the school last April.

Lindberg has California Plant

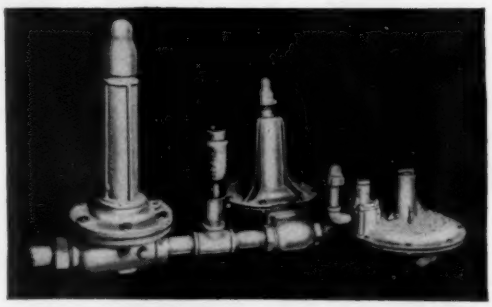
The Lindberg Engineering Company, Chicago, late this month opens its new West Coast plant in Downey, Cal. The new factory comprises 12,000 sq. ft. of production and office space and will be used to manufacture industrial heat treating furnaces and other Lindberg products.

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN *Reynolds* ...



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

DUROFLEX MAKING DIAPHRAGMS AS NEW MANUFACTURER IN FIELD

Duroflex, Inc., a new manufacturer, has started production of synthetic diaphragms for gas meters, regulators and controls in its plant at Buena Vista, Va.

E. C. Hemes

Edward C. Hemes is president of the new corporation. Formerly, he was executive vice president and member of the board of directors of Vulcan Rubber Products, Inc. Prior to his association with Vulcan, in 1946, Mr. Hemes was superintendent of distribution for Milwaukee Gas Light Company.

The production manager of the diaphragm department is Hubert E. Francis, who has been credited with the development of the first moulded type meter diaphragm and who has made numerous subsequent contribution to the meter and regulator industry.

The firm also produces diaphragms for the automotive and aircraft industries, and a full line of coated fabrics for general industrial use.

UGI Authorizes Stock Plan

The United Gas Improvement Company's board of directors at a recent meeting authorized, subject to SEC approval, the distribution of shares of common stocks of Niagara Mohawk Power Corporation and Consumers Power Company to the holders of UGI common stockholders of record at the close of business March 13, 1953.

Distribution will be in the ratios of 1 share of common stock of Niagara Mohawk Power Corp., for each 10 shares of UGI common stock, and 1 share of common stock of Consumers Power Co. for each 20 shares of UGI common stock. No fractional shares will be issued but cash will be paid to UGI stockholders in lieu thereof. It is expected that distribution will be made on or about April 17.

Columbia Gas Elects Two Directors

Ray M. Evans, president of Evans Lead Company, and William B. Anderson, president of Anderson-Newcomb Company, were elected recently to the board of directors of Columbia Gas System, Inc.

Mr. Evans has been president of Evans Lead Company, Charleston, W. Va., since 1924, two years after he and his father, S. M. Evans, aided in founding the company, which came under the ownership of National Lead Company in 1930.

Mr. Anderson, for 21 years has been president of Anderson-Newcomb Company, Huntington, W. Va.

A. O. Smith Opens California Branch

A. O. Smith Corp. has opened a new service branch of its product service division, at Oakland, Cal. The branch is designed to provide a central west coast location for efficient handling of replacement parts, service and repair and training operations.

George A. Carlson has been appointed manager of the branch.

North Dakota to be Compact Member

A resolution giving Governor C. Norman Brunsdale of North Dakota authority to sign the Interstate Oil Compact Commission agreement to make North Dakota a member has passed both houses of the state legislature, Earl Foster, ICCC executive secretary, announced.

Oates Heads PAR Committee

James F. Oates, Jr., chairman, The Peoples Gas Light and Coke Company, is chairman of the 1953 promotion, advertising and research (PAR) committee of American Gas Association. Stuart M. Crocker, chairman of the board, The Columbia Gas System, Inc., and C. H. Zachry, president, Southern Union Gas Company, are vice-chairmen.

The PAR Committee is responsible for raising and disbursing more than $2,000,000 annually, in voluntary subscriptions from transmission and distribution companies, for the gas industry's coordinated programs of promotion, advertising and research.

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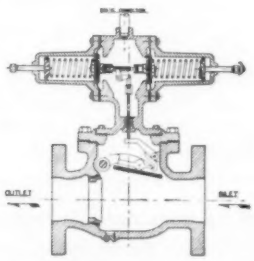
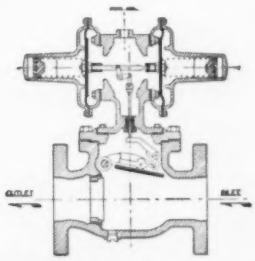
AUTOMATIC SHUT-OFF VALVE
FOR EVERY REQUIREMENT

Security Automatic Shut-Off Valves will provide automatic shut-off in the event of either increase or decrease in pressure. Installation may be upstream or downstream (in relation to the regulator), with or without static line control, for either high or low pressure application.



MODEL "IDPS-H" (closes on Increase *or* Decrease in Pressure; Static line control. High pressure application).



MODEL "IDPS-L" (closes on Increase *or* Decrease in Pressure; Static line control. Low pressure application).

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Long Island City, N. Y.

NEW EQUIPMENT

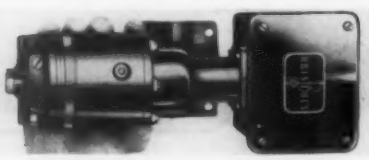
Truck-mounted shovel-crane

Rated at 6 tons capacity this new truck-mounted shovel-crane is available with an assortment of matching attachments, including shovel, clamshell, dragline, back hoe, magnet, wood grapple and pile driver. The new machine can be mounted on any new or used tandem-axle truck having a wheelbase of 164" or more, the manufacturer reports, while single axle trucks can also be used when ground conditions are favorable. It is said that drum-brake control has been made easier for the operator, with a 21-to-1 ratio from pedal to brake band. The full-revolving machine also features anti-friction bearings, machine-cut gears, internal expanding band-type clutches with molded linings and positive rollers, external contracting brakes, band-type swing brake for locking basic unit in desired position, and jackshaft-mounted tagline which can be used for ordinary tagline operation or for a power-operated shovel dipper trip.

Bantam Model T-35. Schield Bantam Co., Waverly, Ia.

Miniature pneumatic transmitter

A miniature pneumatic transmitter for measuring and transmitting readings of temperature, pressure, vacuum, differential pressure and liquid level to recording, indicating and controlling receivers, including miniature type receivers. Transmission is by means of air pressures of between 3 and 5 psi that have direct relations to the measured quantity. The transmitter is sensitive to extremely small changes in the measured value, as little as 0.03 per cent of range, including reversal. Weighing 7½ lbs., it is said the transmitter is weatherproof and can be installed and operated in any location and position.



Bristol Series 650 Pneumatic Transmitter. The Bristol Co., Waterbury 20, Conn.

Service-utility body truck

This 127-inch wheelbase truck with 89-inch service-utility body was designed for on-the-job service or utility work. A light-duty truck, it is powered by a 100-horsepower Silver Diamond 220 engine, and includes such features as a transmission which incorporates a blocker-type synchronizer for more positive shifting, hydraulic brakes with "labyrinth-type" seals, and duplex-type valve shock absorbers. This is but one of the company's new line of light, medium, and heavy-duty motor trucks with 168 basic chassis models in 296 wheelbases. Gross vehicle weight ratings for the new line of trucks range from 4,200 to 90,000 pounds.

International R-120. International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill.

Controlling calorimeter

Consisting of a recording calorimeter and a pneumatic controller, this new unit can be used, reportedly, for accurately controlling the calorific values of gases. The

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for
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A packaged plant as designed, engineered and built by Draketown will provide a completely interchangeable fuel for your natural gas.

Ready in a matter of minutes, your Draketown Plant will click on automatically and take over all or part of your gas load. No delay—no appliance adjustments—no personnel problem.

During gas curtailment periods, "turn on" your Draketown Plant—you will find it pays dividends—it's good "Gas Insurance"!

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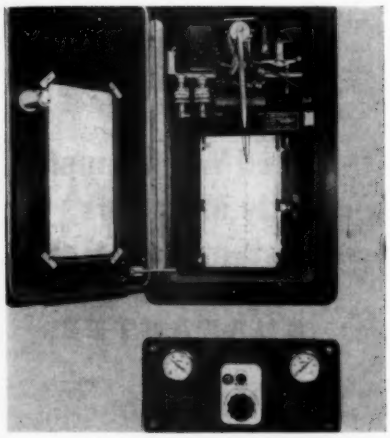
controlling calorimeter is made up of a gas-flow regulator, measuring device, and recording mechanism. Functions of the regulator are to supply gas to the measuring



device at a rate which would be constant if reduced to standard temperature and pressure (60°F and 30 in. of mercury) and also to provide automatic compensation for changes in gas specific gravity and ambient temperature. It is said that the air-operated controller, once set, will continue to give firm and accurate control for long periods without adjustment or maintenance. Mounted within the instrument case, the controller is arranged to detect deviations of the recording pen from the setting pointer, by means of a differential linkage system. Air pressure is used to reposition the control valve to restore the calorific value to its desired level.

Sigma-Kent Controlling Calorimeter. Cosa Corp., 405 Lexington Ave., New York.

One-man fire engine

This dry chemical wheeled engine for extinguishing large-scale B and C fires has a capacity of 150 lbs. and, when fully charged, weighs 480 lbs. The manufacturer states that the model can be easily wheeled, maneuvered and operated by one man. The density of the dispersion of its pressurized discharge is said to have the effect of cooling and insulating the operator from the heat of the fire. It features a discharge range of from 20 to 25 feet. The expellent is dry nitrogen, with a sustained operating pressure of 200 psi during the entire discharge period. The nozzle lever has a spring loaded mechanism which permits opening or closing the nozzle.

Model 150. American-LaFrance-Foamite Corp., Elmira, N. Y.

Masonry saw

This new masonry saw has been developed to cut special shapes from standard refractory stocks as required for intricate

lining construction in furnaces, kilns and boilers. Described as a dustless saw, this unit will prepare such lining shapes as end skews, keys, splits, soaps and wedges. Accordingly, culls and broken firebrick can be salvaged and special shapes produced. Features of this saw, as described by the manufacturer, include a cushioning spring that gives longer blade life, easy adjustment of the cutting head to any height, a factory-sealed water pump that operates safely whether wet or dry, a blade guard that serves as a safety device and eliminates water spray when wet cutting.

Model HD Dustless Clipper Masonry Saw. Clipper Manufacturing Co., 2800 Warwick, Kansas City 8, Mo.

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NEW BULLETINS

INDUSTRIAL TEMPERATURE CONTROL MANUAL. This newly revised bulletin presents the basic principles of industrial temperature control. It defines different types of control systems and distinguishes between them so that the reader can select the type most suited to a particular application. The bulletin discusses: the eight ways of responding to temperature; the five ways of putting that response to work. It takes up evaluation of systems and the important considerations in application engineering. Typical control circuits and piping system arrangements, and the ranges and calibrations of scales and dials are presented diagrammatically.

Bulletin No. 101. Pp. 24. Partlow Corp., New Hartford, N. Y.

SURFACE STANDARD RATED FURNACES. This illustrated bulletin offers information on gas-fired, batch type hardening furnaces. Direct-fired, horizontal hearth types and circular and rectangular salt pot types are included. Also, shown is a complete line of controlled atmosphere equipment for hardening. This includes individual prepared atmosphere generators, horizontal and vertical muffle furnaces, and the new Allcase high production furnace incorporating radiant tubes, recirculating fan and a totally enclosed oil quench.

Bulletin SC-161. Pp. 4. Surface Combustion Corp., Toledo 1, O.

PROCESS PUMPS. This bulletin describes the company's AFL line of process pumps which are particularly suited for reflux pumping and transfer service handling among other liquids the LP gases. These refinery and process service centrifugal pumps, in class AFL, are available in sizes: 1, 1½, 2 and 3 inches; in capacities from 20 to 550 gpm; in pressures to 300 lbs.; and in temperatures to 500°F. The bulletin offers information on shaft, baseplate, casing, balanced impeller, barrel-type cradle, wearing rings, ball bearings, coupling and hooked-type shaft sleeves.

Bulletin 7277. Pp. 4. Ingersoll-Rand, Cameron Pump Division, New York 4, N. Y.

CIRCULAR CASE CONTROLLERS. This illustrated bulletin offers information on an improved model circular case controller, a utility instrument for automatic control of temperature and pressure. The instrument features on-off or proportional (¼ to 100 per cent) control action. It is said to incorporate compact, space-saving design with simple, reliable construction. Information is included in the bulletin on: selection of control action; measuring systems for temperature controllers; temperature bulbs and accessories; measuring elements for pressure controllers, specifications and mounting dimensions.

Bulletin 465. Pp. 16. The Foxboro Co., Foxboro, Mass.

DIESEL ENGINES. This bulletin records the diesel engine's invention and early development, tells about two-cycle and four-cycle types of diesels, explains its operation in simple pictures and words, and reports latest advancements in diesel engine design. Written in non-technical language, the bulletin's main objective is to present an understanding of the engine and its operation.

What You Should Know About Diesel Engines. Pp. 28. P & H diesel div., Harnischfeger Corp., Crystal Lake, Ill.

CENTRIFUGAL PRESSURE BLOWER. Included in this bulletin are photographs, dimension and specification charts, and information on centrifugal pressure blowers of pulley drive, double bearing, single inlet and V-belt drive types. Facts are presented concerning the rotor construction used in the blowers. The dimension and specification charts give capacity and pressure tables which show motor hp, air capacity, actual delivery pressure and outlet size.

Bulletin K-100. Pp. 8. Eclipse Fuel Engineering Co., Rockford, Ill.

DEWPOINT MEASURING EQUIPMENT. This two-color bulletin on dewpoint measuring equipment for continuous accurate indication and recording of dewpoint temperature in a gas stream contains photographs and diagrams of the indicator and recorder. The bulletin also gives applications, descriptions, and operation principles; and provides a chart showing the relation between dewpoint and moisture content of gases.

Bulletin GEC-588A. Pp. 8. General Electric Co., Schenectady 5, N. Y.

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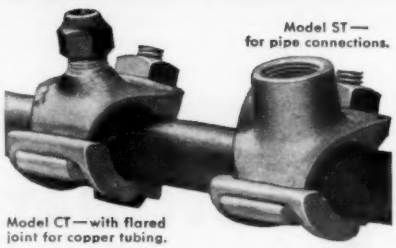
Quick easy way
to make gas connections
FOR LAUNDRIES, DRYERS, REFRIGERATORS, AND OTHERS



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Approved by Underwriters' Laboratories, Inc.

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COMMERCIAL - INDUSTRIAL INCINERATORS. Large-size incinerators that burn wet and dry refuse and are designed to accumulate the refuse before it is burned, are the subject of a new bulletin. The manufacturer states that the equipment will completely consume to 400 pounds per hour of half-wet and half-dry material. Smaller models have a capacity of 100 pounds per hour. The construction of all models is the same. This incinerator does not require brick work or other masonry. It can be installed indoors or outdoors, wherever venting to a flue is possible. Operation is controlled automatically by an electric timer. These incinerators are shipped from the factory knocked-down, with instructions for assembly installation and operation.

Bulletin C20. Winnen Incinerator Co., Bedford, O.

VALVES FOR THE GAS INDUSTRY. Complete descriptions of control, angle, gate, butterfly, reversing and check valves are presented in this bulletin, together with dimension charts for the assortment of valves and information concerning their construction and operation. Manual, electrical and hydraulic, these valves are for low pressure and high pressure, for gas, steam or oil service. The bulletin contains photographs, illustrations and diagrams of the valves together with generally useful engineering data that are applicable to gas design problems.

Bulletin A-205. Pp. 48. The Gas Machinery Co., 16100 Waterloo Road, Cleveland 10.

AMERICAN-STANDARD RADIATOR HEATING. This is a catalog of the manufacturer's radiator heating equipment and is designed for contractor, wholesaler, architect and builder. It is divided into five main sections which deal with boilers, radiation equipment, conversion burners, water heaters, controls and accessories. Also included are data and information concerning the application and installation of the equipment. Guides and technical discussions form a convenient heating reference work.

Catalog R52. American Radiator & Standard Sanitary Corp., Pittsburgh 30.

SERIES OF GAS BOILERS. This bulletin describes and illustrates a new series of gas boilers for heating larger residential, institutional, commercial and industrial buildings. It shows automatic controls; drawings of control systems for hot water and steam installations; tables covering boiler hp., IBR ratings, and AGA input and output ratings for all gases. The boilers are available in eighteen sizes, ranging in net ratings from 1,770 to 12,950 sq. ft. steam radiation, or from 3,010 to 20,720 sq. ft. hot water radiation.

Bulletin 607. National Radiator Co., Johnstown, Pa.

BATCH PRODUCTION HARDENING FURNACES. Gas-fired, batch type hardening furnaces are featured in this illustrated bulletin which includes direct-fired, horizontal hearth types and circular and rectangular salt pot types. It also shows a complete line of controlled atmosphere equipment for hardening, with individual prepared atmosphere generators, horizontal and vertical muffle furnaces, and the new high production furnace incorporating radiant tubes, recirculating fan and a totally enclosed oil quench.

Bulletin SC-161. Surface Combustion Corp., Toledo 1, O.

FITTINGS FOR GAS SERVICE CONNECTIONS. This completely informative and descriptive bulletin presents the many various styles of the manufacturer's fittings for gas service connections, giving dimensions and specifications of the fittings together with information on special connections, corrosion products and gaskets produced by the company. The bulletin offers data on construction, operation and performance features, with charts and photographs to make the uses and applications of the fittings clearly understandable.

Bulletin 5210. Pp. 38. Dresser Manufacturing Division, Dresser Industries, Bradford, Pa.

GAS-FIRED UNIT HEATERS. This is a technical bulletin that describes an expanded line of gas-fired unit heaters. The new line of equipment includes a number of sizes with capacities from 55,000 to 400,000 Btu, burning all types of fuel gases. Special design features are said to be incorporated in these unit heaters, eliminating hot and cold spots on the heat exchangers. Also, it is claimed that there is no combustion chamber radiation loss. A newly-designed line of blower heaters is also featured in this bulletin which includes capacity tables and dimensions.

Bulletin 23-2. Pp. 4. United States Air Conditioning Corp., Minneapolis 14.

DIAPHRAGM MOTOR VALVES. Air-operated diaphragm motor valves are fully described in this bulletin which gives pertinent data such as size, construction, body pressure range, connections and complete mounting dimensions. The valve is said to provide optimum narrow-band proportional control at minimum cost.

Specification Sheet 419-2. Pp. 4. Station 64, Minneapolis-Honeywell Regulator Co., Philadelphia 44.

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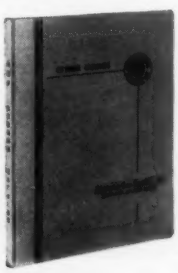

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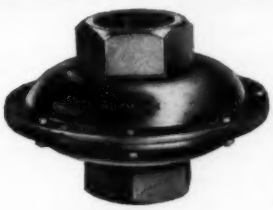

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NORWALK VALVE COMPANY
South Norwalk, Conn.

Portable Combustion Tube for Orsat Gas Analysis

(Continued from page 15)

milliliters per minute. The inlet-end of the spiral will glow more brightly when combustion is taking place. Allow the mercury in the burette to rise to the flash-back arrester. Burn the last traces of sample in the arrester by lowering the mercury a couple of milliliters and again raising it to the arrester. The current is turned off and the combustion products are transferred through the combustion tube to the measuring burette. Allow about one minute for the tube to cool before making the final pressure balance and reading of the volume.

Results and discussion

The results from use of the combustion tube for analyses of natural gas are shown in the accompanying table. Generally, one pass through the combustion tube is sufficient, but if the sample contains more than a couple of per cent of hydrocarbons higher than ethane, one to three additional passes may be necessary to sweep the portion adsorbed on the walls of the Orsat through the combustion tube. These passes should be made at less than 30 milliliters per minute to prevent excessive cooling of the spiral.

The tube has not been tested on vapors higher than n-heptane, but it is believed that no difficulty should be experienced with any of the constituents of gasoline vapors if precautions are taken to prevent losses by adsorption in the sampling and analytical equipment.

In making tests on the flash-back arresters, it was found that flash-back of natural gas-oxygen or hydrogen-oxygen mixtures could be prevented with a bundle of 26 B&S gauge wire, but explosion of pure acetylene-oxygen mixtures was not prevented. Ten per cent of acetylene in natural gas was safe. Although 30 gauge wire did control the acetylene-oxygen mixture, the resulting restriction to the gas flow by such fine wire prevented it from being used in the combustion tube.

No estimate can be made on the life of the combustion tube since none built of quartz have been worn out. After an estimated operating time of 20 hours total for three spirals, no serious deterioration of the platinum has been noted. The quartz tube frosts on the interior from the heat and eventually blackens from minute amounts of platinum. Hot aqua regia rapidly removes the platinum stains. In event the spiral becomes completely fouled in a manner that cannot be remedied by rinsing with mild reagents and water, the spiral should be removed, cleaned with strong reagents and heated to a bright white heat before reassembling.

Adapted from a presentation to Pacific Coast Gas Association Technical Services Conference February 1953

Bacterial Attack is Serious Cause of Corrosion

(Continued from page 23)

soil is responsible for larger numbers of bacteria proximate to the metal than a few inches away.

When possible, the severely corrosive soil sites should be avoided when installing metal pipe systems. When this cannot be done, attention can be given to the improvement of the backfill. Clean sand or gravel may be brought in to provide drainage and aeration in the environment immediately surrounding the pipe.

The application of good protective coatings and the installation of insulating joints are recommended. In the more severely corrosive sites protective coatings are supplemented with cathodic protection. These measures bring in considerations of the economics involved. It is not always economic to coat and cathodically protect all new pipe being installed. Reliable soil surveys are therefore essential to evaluate the site conditions. The bacterial influence requires evaluation along with other factors known to contribute to the corrosiveness of soils.

In water supply systems chlorination is effective. In closed water systems some success has been achieved with toxic organic dyestuffs. One development has been the incorporation of a bacterial inhibitor within the shields for welds and insulating couplings.

Study at standstill

In conclusion it may be said that the study of bacterial corrosion has had an interrupted history of progress in the United States. Just before our entrance into World War II there was an intensive interest in the subject in the East. By the end of the war some excellent research developments in this province were available to the American gas industry. For various reasons applications of these laboratory production items have been largely passed over. This is considered strange since many of the features which characterize soil sites as severely corrosive because of the environment favorable to sulfate-reducing bacteria are also recognized as very corrosive soils because of their physical characteristics.

Ample Funds in Prospect for Utility Expansion

(Continued from page 20)

than 60 per cent last year. Depreciation reserve accruals alone should provide $12.5 billion, or $2 billion more than in 1952; and when retained earnings are added the increase in cash generated from operations is expected to be $3 billion ahead of 1952.

Conversely corporate capital requirements according to the best available present indications might fall one or two billion dollars short of the more than $30 billion expended in 1952.

All signs point to the likelihood that industrial production in 1953's first quarter will exceed by about seven or eight per cent the 1952 average of 221 in the Federal Reserve Board's index, wherein 1935-1939 is used as the theoretical 100 norm. Maintenance of this rate of activity could spell a gain of as much as ten per cent in the total of all corporate profits, and thus reverse the drop of almost like amount registered in 1952 from the preceding year's level. Inventory losses are not expected to recur, and the ending of price controls should permit restoration of better profit margins in a number of instances. Not only did the steel strike do considerable damage from a profits standpoint in 1952 but profits were curtailed by the carryover of the recession in non-durable goods lines which came to an end in mid-1952.

While these favoring signs will be lacking in the utility picture for the most part, it does appear as if operating revenues in this industry will be about seven per cent higher in 1953 than in the past year. Wages and other operating expenses are not increasing in the same relative ratio as receipts and rate relief is coming along—slowly but surely—both through regulatory commission action and by court compulsion.

Common share prices again have been rising, as indicated in the contraction in the yields afforded on the stocks comprising the AMERICAN GAS JOURNAL index. In their favorable action the stocks have been reflecting increased confidence in the profits outlook as well as the recent increase recorded in the ratio of profits being paid as dividends.

During the month of January 1953 dividends were eight per cent ahead of the identical 1952 month, according to the Department of Commerce report. And further increase in the pay-out ratio seems to be in prospect, due both to higher earnings and to the continuing tendency of corporate management to adopt a more liberal attitude toward shareholders. Dividends last year aggregated on the average 55 per cent of

profits, the highest level attained in seven years, compared with only 35 per cent of earnings distributed to stockholders in 1948. By any yardstick the pay-out ratio still is conservative, and further increase in the percentage of pay-out is not unlikely, now that retained earnings are rising and capital requirements are not expected to be larger than in 1952, if as large.

Exec Promotions at Mich Cons

Following a recent meeting of the board of directors of Michigan Consolidated Gas Company, Henry Tuttle, president, announced that Hale A. Clark has been made vice president and sales manager to succeed Newell E. Loomis who is retained as consultant to the president. At the same time it was announced that Karl E. Schmidt has become vice president and engineer; and William A. Rhaesa, treasurer, and Carter E. Shields, controller, were given added responsibilities as vice presidents.

Hale A. Clark

Karl E. Schmidt

Mr. Tuttle also announced that Henry Fink had been elected chairman of the board and that Mr. Fink, Mr. Tuttle and Mr. William G. Woolfolk would continue as the executive committee. Ben E. Young was elected a member of the board of directors to fill the vacancy of the late Walter S. McLucas.

Honeywell Co. Elects G. Seidel VP

Glenn E. Seidel has been elected a vice president of Minneapolis-Honeywell Regulator Company in charge of engineering in the company's Minneapolis plants.

Mr. Seidel, a member of the organization since 1943, has been director of the company's ordnance division for the past year and a half.

Correction: Handbook Issue

The following table of characteristics for two types of odorants produced by Sharples Chemicals, Inc., should be used in place of the tables for the same types on page 65 of the *Handbook* issue, October 15, 1952:

Odorant characteristic	No. 1009E (By-pass type)	No. 1008E (Injection type)
Specific gravity	0.809	0.827
Molecular weight	88	76.5
Weight per gallon pounds	6.74	6.9
Viscosity at 77°F Centistokes	0.795	0.635
Reid vapor pressure	4.9	5.33
Distillation	IBP—120°F 95% 180°F	IBP —120°F 95% 270°F
Freezing point	Below —103°F	Below —130°F
Mercaptan content	94%	94%
Sulphur content (% by wt.)	34	37
Toxicity at normal concentration	none	none
Solubility in water (% by vol.)	0.16%	0.44%
Recommended odorizing rate	0.5 lb/MMcf	0.5 lb/MMcf
Sulphur contrib. at rec. rate (gr./100 cf)	0.12	0.13

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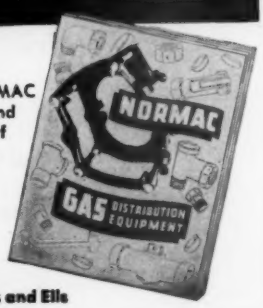

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GAS INDUSTRY CALENDAR

March

26-27 NEGA annual meeting, Hotel Statler, Boston.
26-27 Oklahoma Utilities Association, Tulsa, Okla.
27-29 Mid-West regional gas sales conference, Edgewater Beach Hotel, Chicago.
30-Apr. 1 Mid-West Gas Assn., Broadmoor Hotel, Colorado Springs, Colo.

April

13-16 AGA distribution, motor vehicles and corrosion conference, Hotel Sherman, Chicago.
13-15 AGA industrial and commercial gas sales conference, Hotel Warwick, Philadelphia.
16-18 Florida-Georgia Gas Association, Hotel Biltmore, Palm Beach.
21-23 Southwestern measurement course, University of Oklahoma, Norman.
23-24 Indiana Gas Association convention, French Lick Springs Hotel, French Lick.
27-29 Mid-West regional gas sales conference, Edgewater Beach Hotel, Chicago.
28-29 PCGA technical section, distribution, San Jose, Cal.
29-May 1 New England hotel and restaurant show, Statler Hotel, Boston.
30-May 1 AGA transmission and storage conference, Edgewater Beach Hotel, Chicago.

May

3-8 LPGA convention and show, Conrad Hilton Hotel, Chicago.
4-5 AGA eastern natural gas regional sales conference, Wm. Penn Hotel, Pittsburgh.
4-8 AGA industrial gas school, Sheraton-Cadillac Hotel, Detroit.
10-15 National restaurant convention and exposition, Navy Pier, Chicago.
11-13 Southern Gas Assn., Jung Hotel, New Orleans.
11-15 National Fire Protection Assn., Edgewater Beach Hotel, Chicago.
12-14 Pennsylvania Gas Association convention.
20-22 GAMA annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.
25-27 AGA production and chemical conference, Hotel New Yorker, New York.
28-29 The Natural Gas and Petroleum Association of Canada, London, Ontario.

June

14-18 Canadian Gas Association, Windsor Hotel, Montreal.
22-23 Michigan Gas Association, Grand Hotel, Mackinac Island.

August

24-26 Appalachian gas measurement short course, West Virginia University, Morgantown, W. Va.

September

9-11 PCGA, San Francisco.
11 New Jersey Gas Association, Spring Lake, N. J.

October

19-23 National metal exposition, Public Auditorium, Cleveland.
26-29 AGA annual convention, Kiel Auditorium, St. Louis.

November

11-13 Wisconsin Utilities Association, Hotel Schroeder, Milwaukee, Wis.
29-December 4 The American Society of Mechanical Engineers, Statler Hotel, New York.
30-December 2 Southern Gas Association, advisory council and management conference, Grand Hotel, Point Clear, Ala.

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